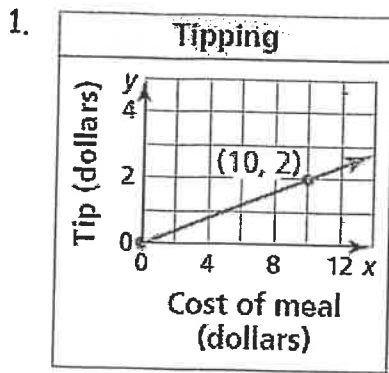


Name _____

Use the graph to write an equation of the line and interpret the slope.

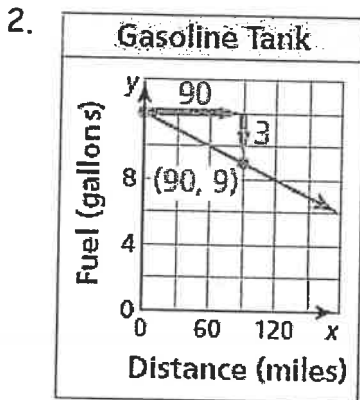
 $(0, 0)$ $(10, 2)$

$$\text{Slope} = \frac{2-0}{10-0} = \frac{2}{10} = \frac{1}{5}$$

$$y - 0 = \frac{1}{5}(x - 0)$$

$$y = \frac{1}{5}x$$

As cost increases, so does the tip

rise $\rightarrow 3$ run to left $\rightarrow -90$

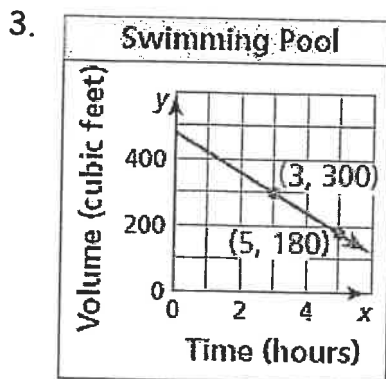
$$\frac{3}{-90} = -\frac{1}{30}$$

$$y - 9 = -\frac{1}{30}(x - 90)$$

$$y - 9 = -\frac{1}{30}x + \frac{3}{1}$$

$$y = -\frac{1}{30}x + 12$$

As you drive more, your fuel goes down.

 $(3, 300)$ $(5, 180)$

$$\frac{300-180}{3-5} = \frac{120}{-2} = -60$$

$$y - 180 = -60(x - 5)$$

$$y - 180 = -60x + 300$$

$$y = -60x + 480$$

As time goes on, the volume of the pool decreases

4. Two newspapers charge a fee for placing an advertisement in their paper plus a fee based on the number of lines in the advertisement. The table shows the total costs for different length advertisements at the Daily Times. The total cost y (in dollars) for an advertisement that is x lines long at the Greenville Journal is represented by the equation $y = 2x + 20$. Which newspaper charges less per line? How many lines must be in an advertisement for the total costs to be the same?

Daily Times	
Number of lines, x	Total cost, y
4	27
5	30
6	33
7	36
8	39

$$\left(\begin{array}{l} (4, 27) \\ (5, 30) \end{array} \right) = \frac{30 - 27}{5 - 4} = \frac{3}{1} = 3$$

$$y = 2x + 20 \rightarrow \text{slope} = 2$$

Greenville charges less

$$y - 27 = 3(x - 4)$$

$$y - 27 = 3x - 12$$

$$+27 \quad +27$$

$$y = 3x + 15$$

$$3x + 15 = 2x + 20$$

$$-2x \quad -15 \quad -2x \quad -15$$

$$x = 5$$

5 lines to be the same

Name _____

Graph the function. Label the vertex and axis of symmetry.

1. $F(x) = (x - 3)^2$

Vertex $\rightarrow (3, 0)$

Axis $\rightarrow x = 3$

2. $H(x) = (x + 4)^2$

V $\rightarrow (-4, 0)$

Axis $\rightarrow x = -4$

3. $g(x) = (x + 3)^2 + 5$

V $\rightarrow (-3, 5)$

Axis $\rightarrow x = -3$

4. $Y = (x - 7)^2 - 1$

V $\rightarrow (7, -1)$

Axis $\rightarrow x = 7$

5. $y = -4(x - 2)^2 + 4$

V $\rightarrow (2, 4)$

Axis $\rightarrow x = 2$

6. $G(x) = 2(x + 1)^2 - 3$

V $\rightarrow (-1, -3)$

Axis $\rightarrow x = -1$

7. $f(x) = -2(x - 1)^2 + 1$

V $\rightarrow (1, 1)$

Axis $\rightarrow x = 1$

8. $H(x) = 4(x + 4)^2 + 6$

V $\rightarrow (-4, 6)$

Axis $\rightarrow x = -4$

9. $y = -1/4(x + 2)^2 + 1$

V $\rightarrow (-2, 1)$

Axis $\rightarrow x = -2$

10. $Y = \frac{1}{2}(x - 3)^2 + 2$

V $\rightarrow (3, 2)$

Axis $\rightarrow x = 3$

11. $f(x) = 0.4(x - 1)^2$

V $\rightarrow (1, 0)$

Axis $\rightarrow x = 1$

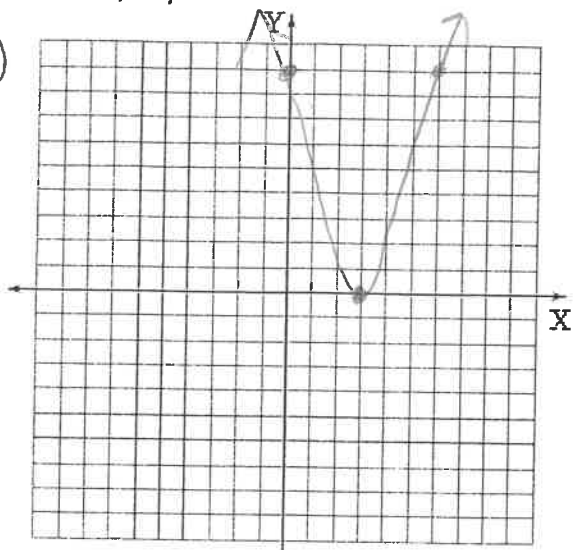
12. $G(x) = 0.75x^2 - 5$

V $\rightarrow (0, -5)$

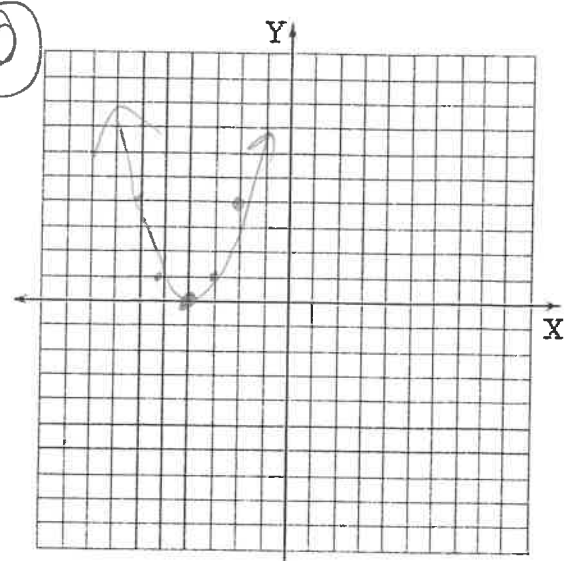
Axis $\rightarrow x = 0$

College Algebra – Chapter 1
Lesson 2, Day 1

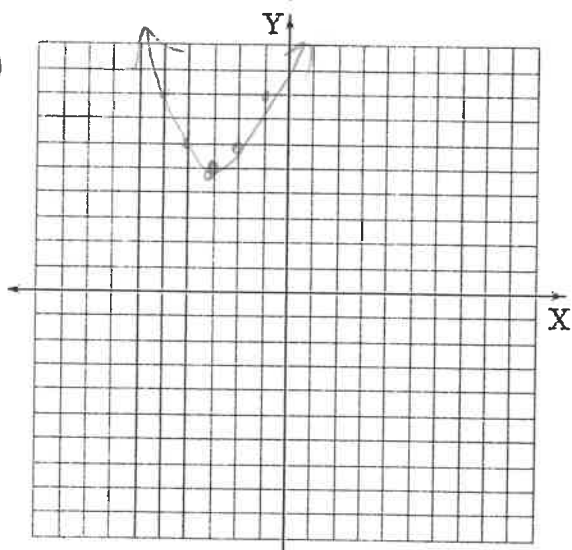
1



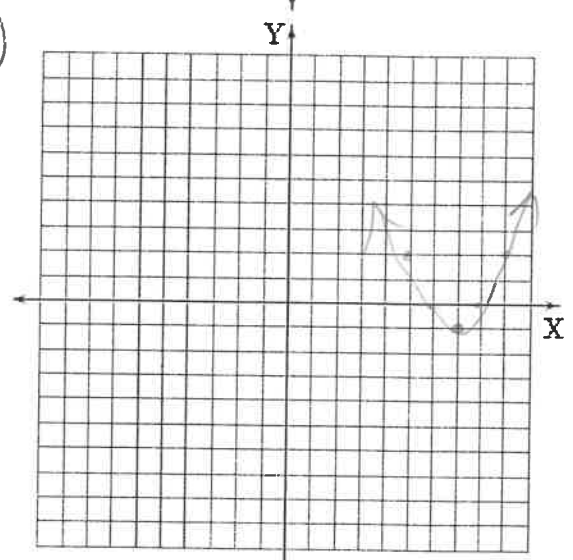
2



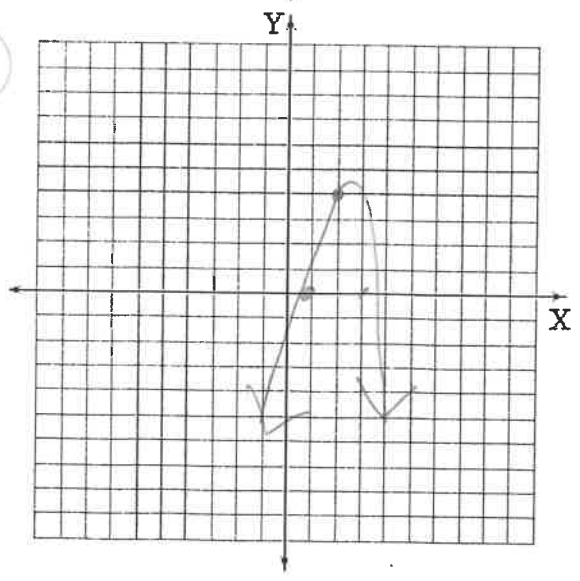
3



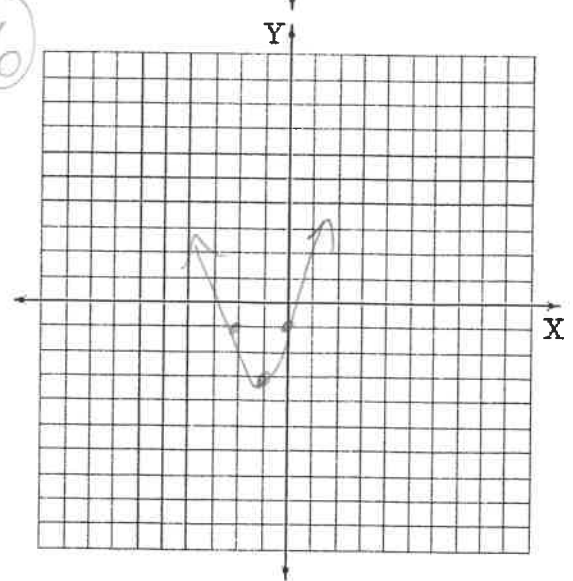
4



5



6



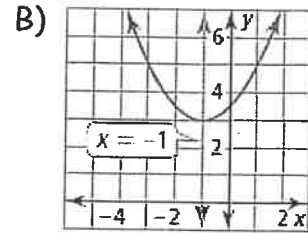
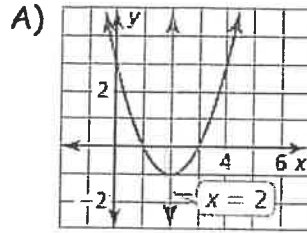
College Algebra – Chapter 1

Lesson 2, Day 1

Use the axis of symmetry to match the equation with its graph.

13. $y = 2(x - 3)^2 + 1$

C

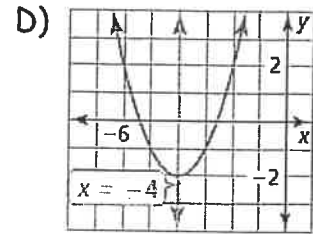
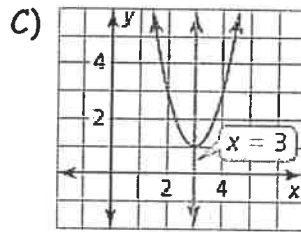


14. $y = (x + 4)^2 - 2$

D

15. $y = \frac{1}{2}(x + 1)^2 + 3$

B



16. $y = (x - 2)^2 - 1$

A

Graph the function. Label the vertex and axis of symmetry.

17. $y = x^2 + 2x + 1$

$-\frac{b}{2a} = -\frac{2}{2(1)} = -\frac{2}{2} = -1$

V → (-1, 0)
A/S → x = -1

$(-1)^2 + 2(-1) + 1 = 1 - 2 + 1 = 0$

$-1 + 1 = 0$

19. $y = -4x^2 + 8x + 2$

$-\frac{b}{2a} = -\frac{8}{2(-4)} = 1$

V → (1, 6)
A/S → x = 1

$-4(1)^2 + 8(1) + 2 = -4 + 8 + 2 = 6$

$-4 + 8 + 2 = 4 + 2 = 6$

21. $g(x) = -x^2 - 1$

V → (0, -1)

A/S → x = 0

18. $y = 3x^2 - 6x + 4$

$-\frac{(-6)}{2(3)} = \frac{6}{6} = 1$

Vertex → (1, 1)
A/S → x = 1

$3(1)^2 - 6(1) + 4 = 3 - 6 + 4 = 1$

$3 - 6 + 4 = -3 + 4 = 1$

20. $F(x) = -x^2 - 6x + 3$

$-\frac{(-6)}{2(-1)} = \frac{6}{-2} = -3$

V → (-3, 12)
A/S → x = -3

$-(-3)^2 - 6(-3) + 3 = -9 + 18 + 3 = 12$

$-9 + 18 + 3 = 9 + 3 = 12$

22. $F(x) = 6x^2 - 5$

V → (0, -5)

A/S → x = 0

23. $g(x) = -1.5x^2 + 3x + 2 \rightarrow -\frac{3}{2}x^2 + 3x + 2$

$-\frac{3}{2(-3)} = \frac{3}{-3} = -1$

V → (1, 2.5)
A/S → x = 1

$-\frac{3}{2}(1)^2 + 3(1) + 2 = -\frac{3}{2} + 3 + 2 = 2.5$

$-\frac{3}{2} + \frac{6}{2} + \frac{4}{2} = \frac{3}{2} + \frac{4}{2} = \frac{7}{2}$

25. $y = \frac{3}{2}x^2 - 3x + 6$

$-\frac{(-3)}{2(\frac{3}{2})} = \frac{3}{3} = 1$

V → (1, 7/2)
A/S → x = 1

$\frac{3}{2}(1)^2 - 3(1) + 6 = \frac{3}{2} - 3 + 6 = \frac{7}{2}$

$\frac{3}{2} - \frac{6}{2} + \frac{12}{2} = \frac{7}{2}$

24. $F(x) = 0.5x^2 + x - 3 \rightarrow \frac{1}{2}x^2 + x - 3$

$-\frac{1}{2(\frac{1}{2})} = -\frac{1}{1} = -1$

V → (-1, -3.5)
A/S → x = -1

$\frac{1}{2}(1)^2 + (1) - 3 = \frac{1}{2} + 1 - 3 = -1.5$

$\frac{1}{2} + \frac{2}{2} - \frac{6}{2} = \frac{3}{2} - \frac{6}{2} = -\frac{3}{2}$

26. $y = -5/2x^2 - 4x - 1$

$-\frac{(-4)}{2(-\frac{5}{2})} = -\frac{4}{-5} = \frac{4}{5}$

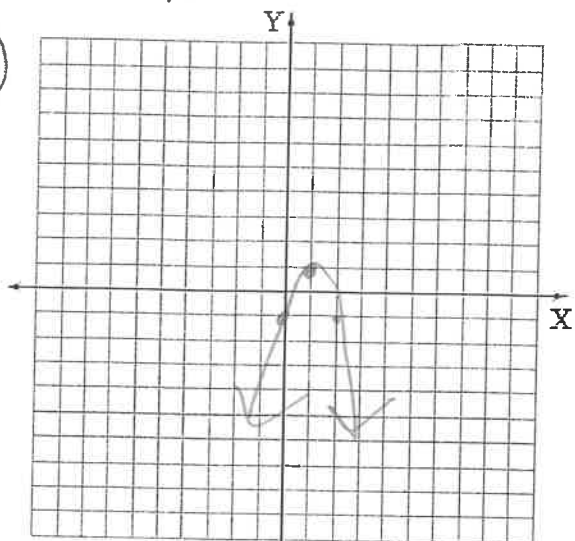
V → (-4/5, 9/10)
A/S → x = -4/5

$-\frac{5}{2}(\frac{4}{5})^2 - 4(\frac{4}{5}) - 1 = -\frac{5}{2}(\frac{16}{25}) - \frac{16}{5} - 1 = -\frac{4}{5} - \frac{16}{5} - 1 = -\frac{21}{5} = -4.2$

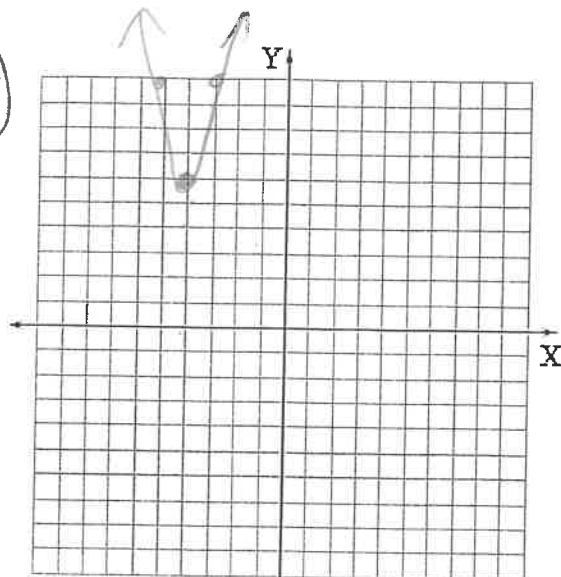
$-\frac{10}{10} + \frac{32}{10} - \frac{10}{10} = \frac{12}{10} - \frac{10}{10} = \frac{2}{10} = \frac{1}{5}$

College Algebra – Chapter 1
Lesson 2, Day 1

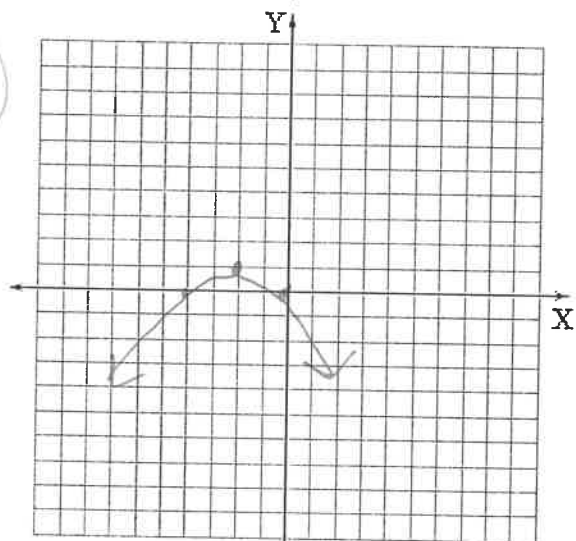
8



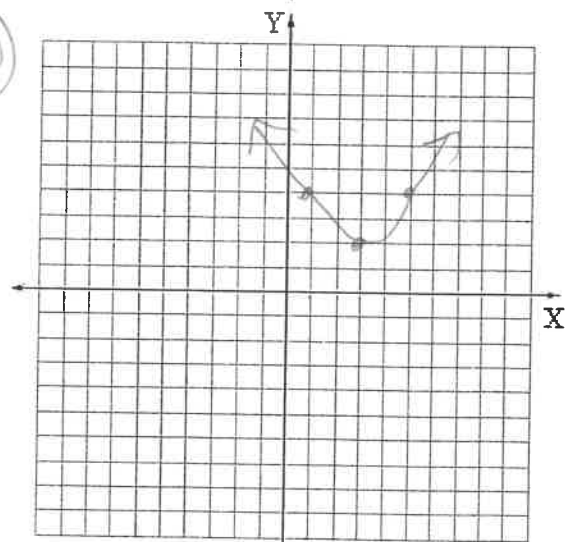
9



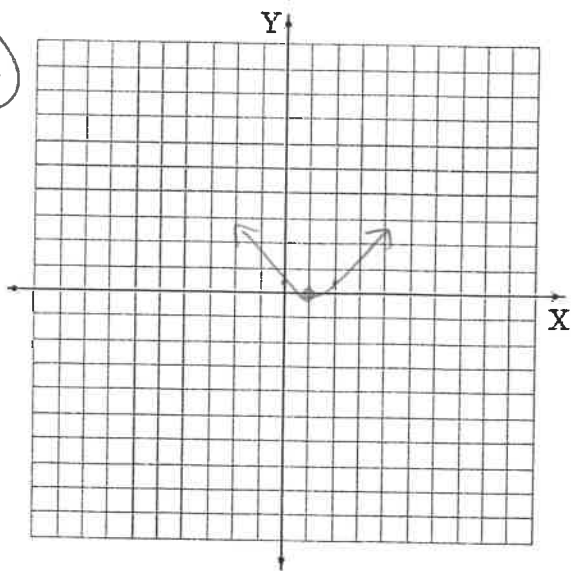
10



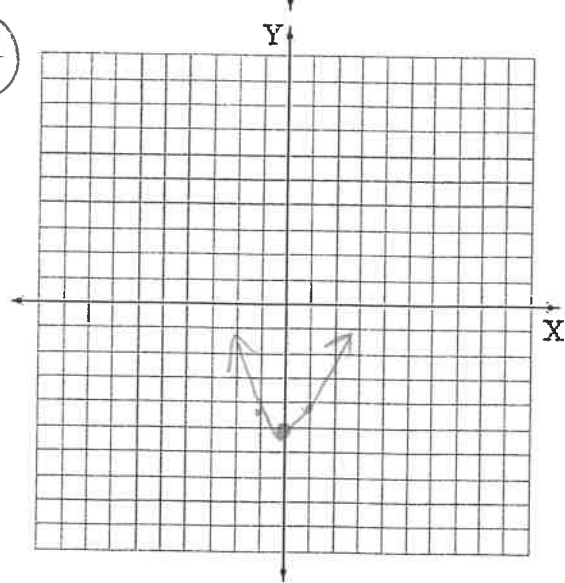
11



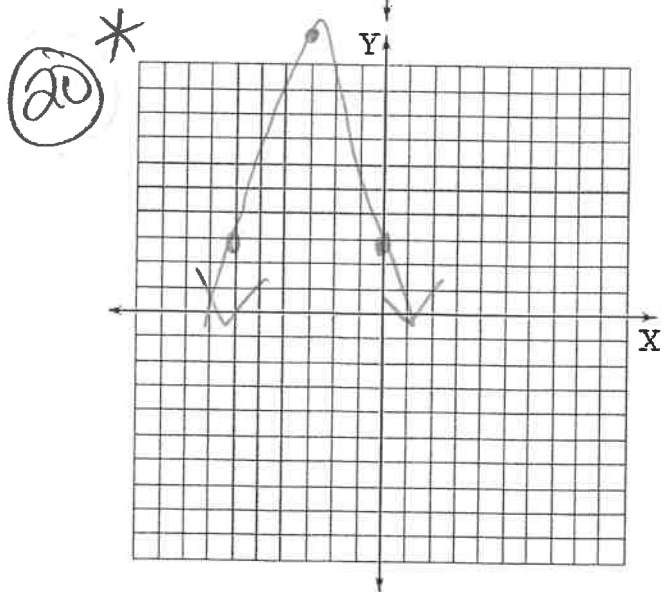
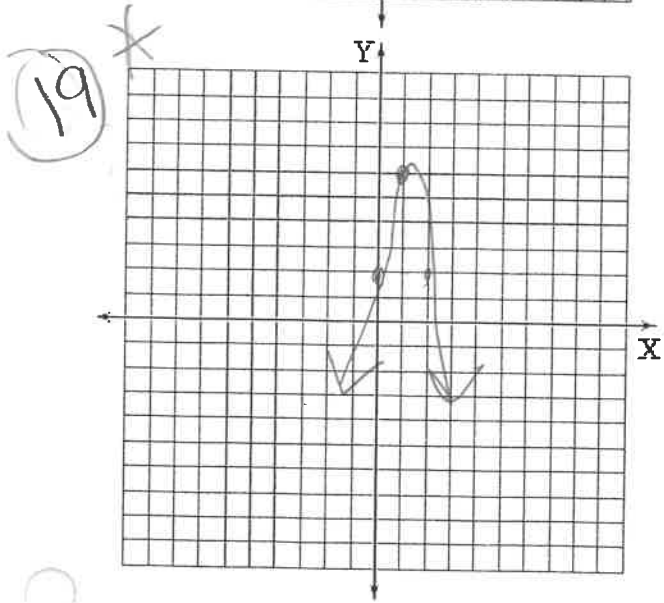
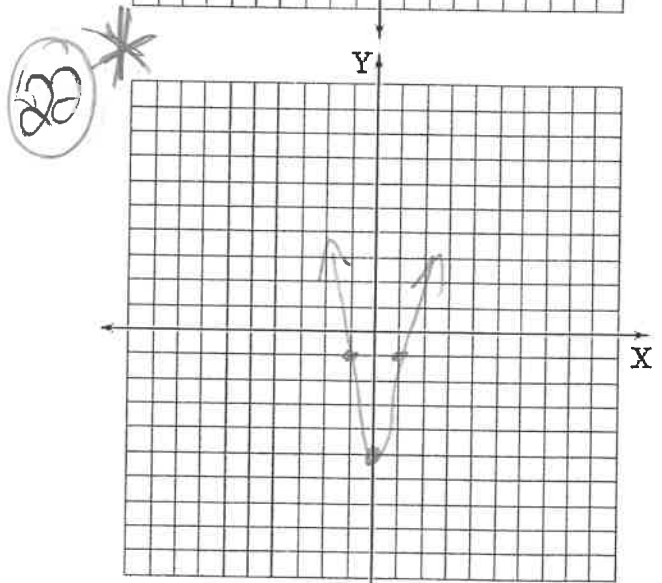
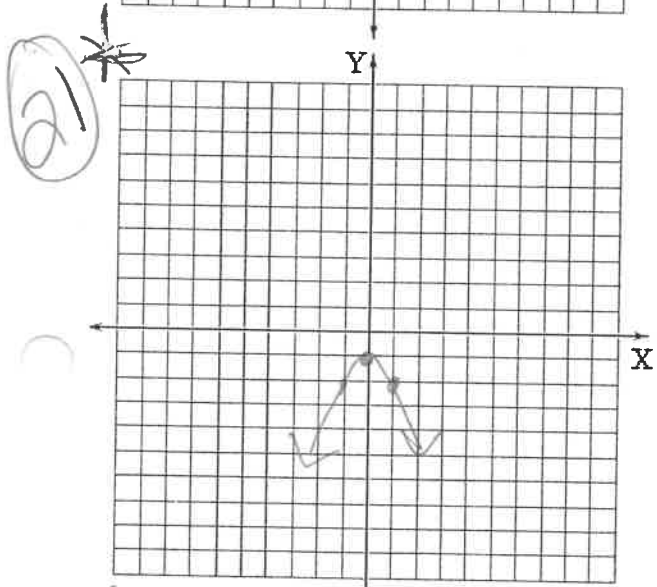
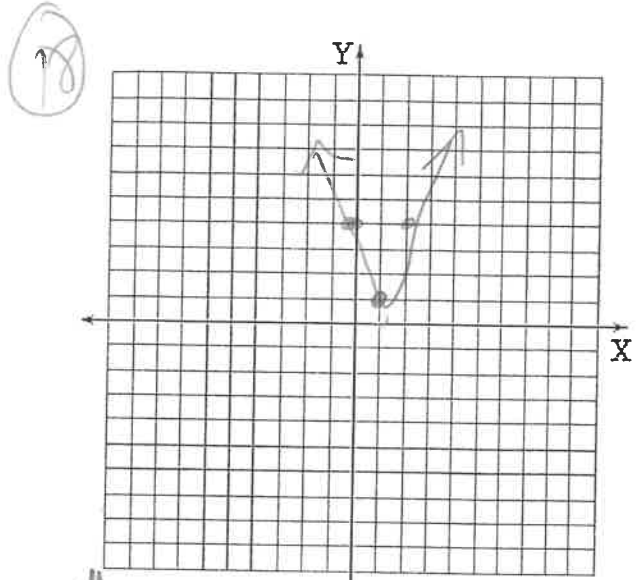
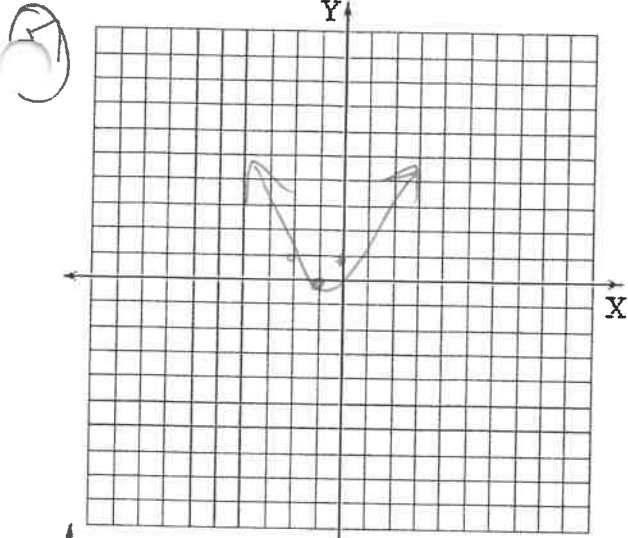
12



13

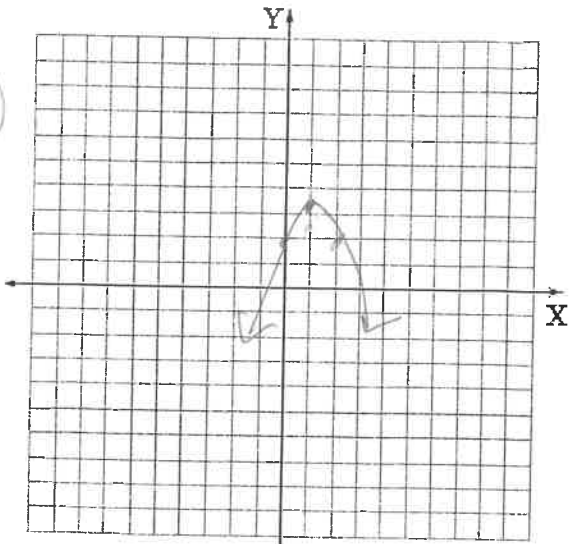


College Algebra – Chapter 1
 Lesson 2, Day 1

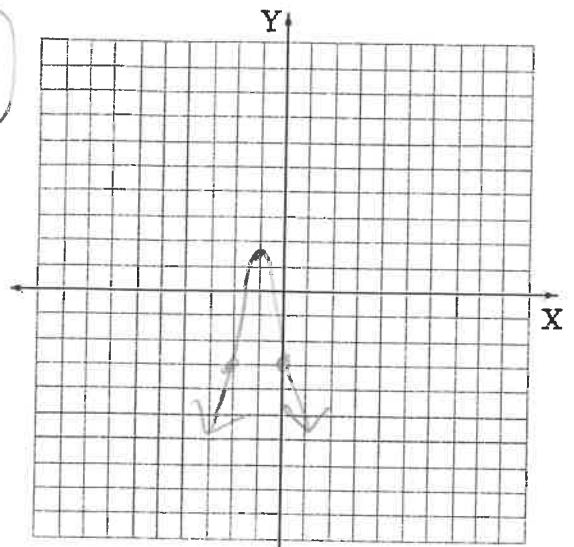


College Algebra – Chapter 1
Lesson 2, Day 1

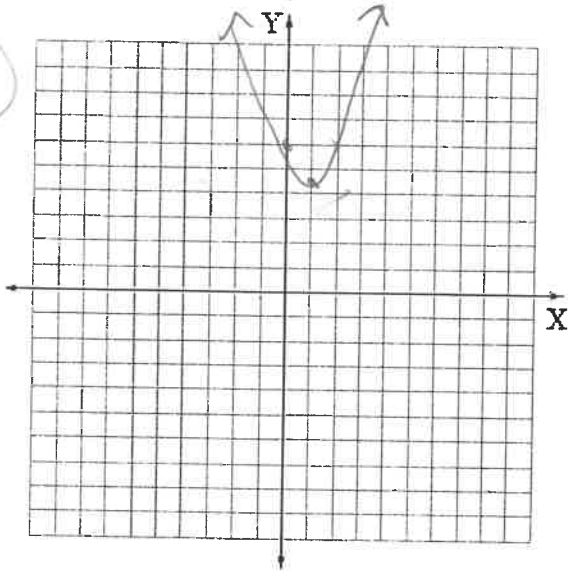
23



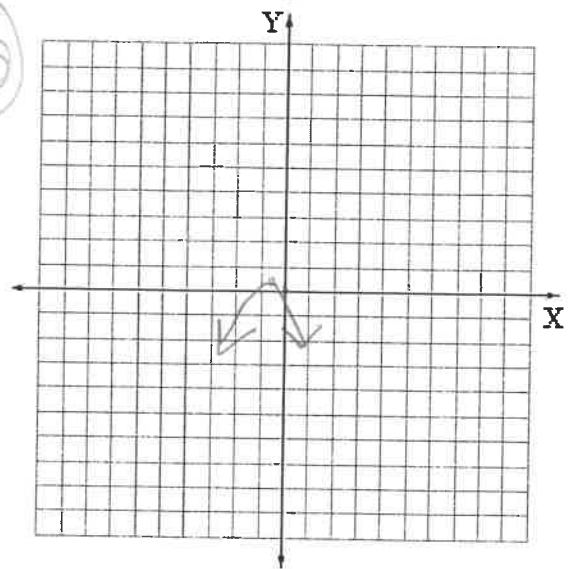
24



25



26
by 5



Name _____

Find the discriminant of the quadratic equation and describe the number and type of solutions of the equation.

1. $x^2 + 12x + 36 = 0$

$$\sqrt{12^2 - 4(1)(36)}$$

$$\sqrt{144 - 144}$$

$$\sqrt{0} = 0$$

1 Real

2. $x^2 - x + 6 = 0$

$$\sqrt{(-1)^2 - 4(1)(6)}$$

$$\sqrt{1 - 24}$$

$$\sqrt{-23}$$

2 Imaginary

3. $4n^2 - 4n - 24 = 0$

$$\sqrt{(-4)^2 - 4(4)(-24)}$$

$$\sqrt{16 + 384}$$

$$\sqrt{400} = 20$$

2 Real

4. $-x^2 + 2x + 12 = 0$

$$\sqrt{2^2 - 4(-1)(12)}$$

$$\sqrt{4 + 48}$$

$$\sqrt{52}$$

2 Real

5. $4x^2 = 5x - 10$

$$4x^2 - 5x + 10$$

$$\sqrt{(-5)^2 - 4(4)(10)}$$

$$\sqrt{25 - 160}$$

$$\sqrt{-135}$$

2 Imaginary

6. $-18p = p^2 + 81$

$$-p^2 - 18p - 81$$

$$\sqrt{(-18)^2 - 4(-1)(81)}$$

$$\sqrt{324 - 324}$$

$$\sqrt{0} = 0$$

1 Real

7. $24x = -48 - 3x^2$

$$3x^2 + 24x + 48$$

$$\sqrt{24^2 - 4(3)(48)}$$

$$\sqrt{576 - 576}$$

$$\sqrt{0} = 0$$

1 Real

8. $-2x^2 - 6 = x$

$$-2x^2 - x - 6$$

$$\sqrt{(-1)^2 - 4(-2)(-6)}$$

$$\sqrt{1 - 48}$$

$$\sqrt{-47}$$

2 Imaginary

9. What are the complex solutions of the equation $2x^2 - 16x + 50 = 0$?

$$\frac{-(-16) \pm \sqrt{(-16)^2 - 4(2)(50)}}{2(2)}$$

$$\frac{16 \pm \sqrt{256 - 400}}{4}$$

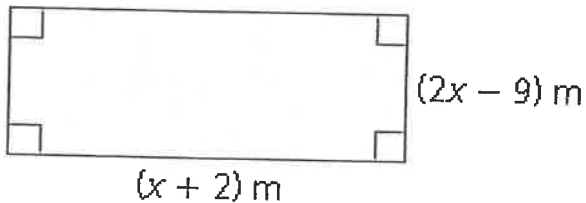
$$\frac{16 \pm \sqrt{-144}}{4}$$

$$\frac{16 \pm 12i}{4}$$

$$4 \pm 3i$$

Find the value for x.

10. Area of the rectangle = 24 m^2



$$(x+2)(2x-9) = 24$$

$$2x^2 - 9x + 4x - 18 = 24$$

$$2x^2 - 5x - 18 = 24$$

$$-24 \quad -24$$

$$2x^2 - 5x - 42 = 0$$

$$\frac{-(-5) \pm \sqrt{(-5)^2 - 4(2)(-42)}}{2(2)}$$

$$\frac{5 \pm \sqrt{25 + 336}}{4}$$

$$\frac{5 \pm \sqrt{361}}{4}$$

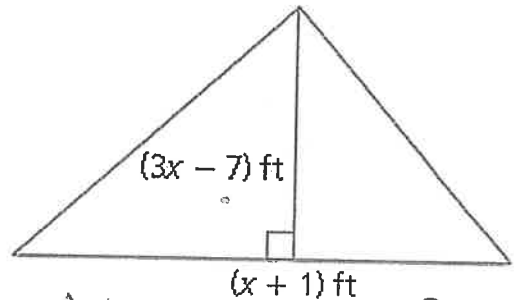
$$\frac{5 \pm 19}{4}$$

$$\frac{5+19}{4} = \frac{24}{4} = 6$$

$$\frac{5-19}{4} = \frac{-14}{4} = -\frac{7}{2}$$

Can't be negative

11. Area of the triangle = 8 ft^2



$$\frac{1}{2}(x+1)(3x-7) = 8$$

$$\frac{1}{2}(3x^2 - 7x + 3x - 7) = 8$$

$$\frac{1}{2}(3x^2 - 4x - 7) = 8$$

$$\frac{3}{2}x^2 - 2x - \frac{7}{2} = 8$$

$$-\frac{7}{2} \quad -8$$

$$\frac{3}{2}x^2 - 2x - \frac{23}{2} = 0$$

$$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(\frac{3}{2})(-\frac{23}{2})}}{2(\frac{3}{2})}$$

$$\frac{2 \pm \sqrt{4 + 69}}{3}$$

$$\frac{2 \pm \sqrt{73}}{3}$$

$$\frac{2 + \sqrt{73}}{3} \approx 3.5$$

$$\frac{2 - \sqrt{73}}{2} \approx -2.12$$

Can't be neg

Name _____

Find the minimum or maximum value of the function. Describe the domain and range of the function, and where the function is increasing and decreasing.

1. $y = 6x^2 - 1$

$$V \rightarrow (0, -1)$$

 $a \rightarrow +$, so $(0, -1)$ is minimum

$D \rightarrow \text{ARN}$

 $R \rightarrow \text{all Reals } > -1$ Inc \rightarrow right $x=0$ Dec \rightarrow left $x=0$

2. $y = 9x^2 + 7$

$$V \rightarrow (0, 7)$$

 $a \rightarrow +$ so, $(0, 7)$ is minimum

$D \rightarrow \text{ARN}$

 $R \rightarrow \text{all reals } > 7$ Inc \rightarrow right $x=0$ Dec \rightarrow left $x=0$

3. $y = -x^2 - 4x - 2$

$$V \rightarrow -\frac{(-4)}{2(-1)} \Rightarrow \frac{4}{2} = 2$$

$$-(-2)^2 - 4(-2) - 2 \Rightarrow -(4) + 8 - 2 \Rightarrow -4 + 8 - 2 \Rightarrow 4 - 2 = 2$$

$$V \rightarrow (-2, 2)$$

 $a \rightarrow -$, so $(-2, 2)$ is maximum

$D \rightarrow \text{ARN}$

 $R \rightarrow \text{all Reals } < 2$ Inc \rightarrow left $x = -2$ Dec \rightarrow right $x = -2$

4. $G(x) = -3x^2 - 6x + 5$

$$V \rightarrow -\frac{(-6)}{2(-3)} = \frac{6}{-6} = -1$$

$$-3(-1)^2 - 6(-1) + 5 \Rightarrow -3(1) + 6 + 5 \Rightarrow -3 + 6 + 5 \Rightarrow 3 + 5 = 8$$

$$V \rightarrow (-1, 8)$$

 $a \rightarrow -$, so $(-1, 8)$ is maximum

$D \rightarrow \text{ARN}$

 $R \rightarrow \text{all reals } < 8$ Inc \rightarrow left $x = -1$ Dec \rightarrow right $x = -1$

5. $f(x) = -2x^2 + 8x + 7$

$$V \rightarrow -\frac{8}{2(-2)} = \frac{-8}{-4} = 2$$

$$-2(2)^2 + 8(2) + 7 \Rightarrow -2(4) + 16 + 7 \Rightarrow -8 + 16 + 7 \Rightarrow 8 + 7 = 15$$

$$V \rightarrow (2, 15)$$

 $a \rightarrow -$, so $(2, 15)$ is maximum

$D \rightarrow \text{ARN}$

 $R \rightarrow \text{all reals } < 15$ Inc \rightarrow left $x = 2$ Dec \rightarrow right $x = 2$

6. $F(x) = 3x^2 + 18x - 5$

$$V \rightarrow -\frac{18}{2(3)} = \frac{-18}{6} = -3$$

$$3(-3)^2 + 18(-3) - 5 \Rightarrow 3(9) - 54 - 5 \Rightarrow 27 - 54 - 5 \Rightarrow -27 - 5 = -32$$

$$V \rightarrow (-3, -32)$$

 $a \rightarrow +$, so $(-3, -32)$ is minimum

$D \rightarrow \text{ARN}$

 $R \rightarrow \text{all reals } > -32$ Inc \rightarrow right $x = -3$ Dec \rightarrow left $x = -3$

College Algebra - Chapter 1

Lesson 2, Day 2

7. $g(x) = 2x^2 - 12x$

$$\frac{-b}{2a} = \frac{-(-12)}{2(2)} = 3$$

$$2(-3)^2 - 12(-3) \Rightarrow 2(9) + 36 \Rightarrow 18 + 36 = 54$$

$V \rightarrow (-3, 54)$

$a \rightarrow +$, so $(-3, 54)$ is minimum

$D \rightarrow \text{ARN}$

$R \rightarrow \text{all real } > 54$

$\text{Inc} \rightarrow \text{right } x = -3$

$\text{dec} \rightarrow \text{left } x = -3$

8. $G(x) = x^2 - 4x$

$$\frac{-b}{2a} = \frac{-(-4)}{2(1)} = 2$$

$$(-2)^2 - 4(-2) \Rightarrow 4 + 8 = 12$$

$V \rightarrow (-2, 12)$

$a \rightarrow +$, so $(-2, 12)$ is minimum

$D \rightarrow \text{ARN}$

$R \rightarrow \text{ARN } > 12$

$\text{Inc} \rightarrow \text{right } x = -2$

$\text{dec} \rightarrow \text{left } x = -2$

9. $y = \frac{1}{4}x^2 - 3x + 2$

$$\frac{-b}{2a} = \frac{-(-3)}{2(\frac{1}{4})} = -6$$

$$\frac{1}{4}(-6)^2 - 3(-6) + 2 \Rightarrow \frac{1}{4}(36) + 18 + 2 \Rightarrow 9 + 18 + 2 = 29$$

$V \rightarrow (-6, 29)$

$a \rightarrow +$, so $(-6, 29)$ is minimum

$D \rightarrow \text{ARN}$

$R \rightarrow \text{ARN } > 29$

$\text{Inc} \rightarrow \text{right } x = -6$

$\text{dec} \rightarrow \text{left } x = -6$

10. $F(x) = \frac{3}{2}x^2 + 6x + 4$

$$\frac{-b}{2a} = \frac{-6}{2(\frac{3}{2})} = -2$$

$$\frac{3}{2}(-2)^2 + 6(-2) + 4 \Rightarrow \frac{3}{2}(4) + 12 + 4 \Rightarrow 6 + 12 + 4 = 22$$

$V \rightarrow (-2, 22)$

$a \rightarrow +$, so $(-2, 22)$ is minimum

$D \rightarrow \text{ARN}$

$R \rightarrow \text{ARN } > 22$

$\text{Inc} \rightarrow \text{right } x = -2$

$\text{dec} \rightarrow \text{left } x = -2$

11. The path of a diver is modeled by the function $f(x) = -9x^2 + 9x + 1$, where $f(x)$ is the height of the diver (in meters) above the water and x is the horizontal distance (in meters) from the end of the diving board.

a. What is the height of the diving board?

$$x = 0 \rightarrow -9(0)^2 + 9(0) + 1 \Rightarrow 1$$

1 meter

b. What is the maximum height of the diver?

$$\frac{-b}{2a} = \frac{-9}{2(-9)} = \frac{1}{2}$$

$$-9\left(\frac{1}{2}\right)^2 + 9\left(\frac{1}{2}\right) + 1 \Rightarrow -9\left(\frac{1}{4}\right) + \frac{9}{2} + 1 \Rightarrow -\frac{9}{4} + \frac{18}{4} + \frac{4}{4} = \frac{13}{4}$$

$\approx 3\frac{1}{4}$ meters high

c. Describe where the diver is ascending and where the diver is descending.

Ascending from time left the board until he was $7\frac{3}{4}$ meters high, then descended to the water

12. The engine torque y (in foot-pounds) of one model of car is given by

$y = -3.75x^2 + 23.2x + 38.8$, where x is the speed (in thousands of revolutions per minute) of the engine.

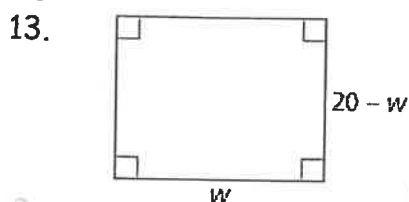
a. Find the engine speed that maximizes the torque. What is the maximum torque?

$$\rightarrow \frac{23.2}{2(-3.75)} \approx \boxed{3.09} \quad 74.7$$

b. Explain what happens to the engine torque as the speed of the engine increases.

torque goes up til max is hit, then goes down

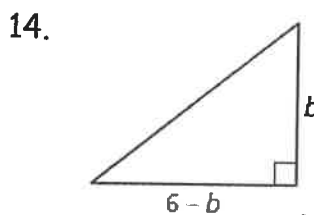
Write an equation for the area of the figure. Then determine the maximum possible area of the figure.



$$A = w(20-w) \Rightarrow 20w - w^2$$

$$\text{Max: } -\frac{b}{2a} \Rightarrow -\frac{20}{2(-1)} = \frac{20}{2} = 10$$

$$20(10) - (10)^2 \Rightarrow 200 - 100 = \boxed{100}$$



$$A = \frac{1}{2}(6-b)(b) \Rightarrow \frac{1}{2}(6b - b^2)$$

$$\Rightarrow \boxed{3b - \frac{1}{2}b^2}$$

$$\text{max: } -\frac{3}{2(-\frac{1}{2})} = \frac{3}{1} = 3$$

$$3(3) - \frac{1}{2}(3)^2 \Rightarrow 9 - \frac{1}{2}(9) \Rightarrow 9 - \frac{9}{2}$$

$$\frac{18}{2} - \frac{9}{2} = \boxed{\frac{9}{2}}$$

Graph the function, label the x-intercept(s), vertex, and axis of symmetry.

15. $y = (x+3)(x-3)$ Axis: $x=0$
 X-int: $-3, 3$
 V: $\frac{-3+3}{2} = \frac{0}{2} = 0$
 $(0+3)(0-3) = (3)(-3) = -9$
 $(0, -9)$

16. $y = (x+1)(x-3)$ Axis: $x=1$
 X-int: $-1, 3$
 V: $\frac{-1+3}{2} = \frac{2}{2} = 1$
 $(1+1)(1-3) \Rightarrow (2)(-2) = -4$
 $(1, -4)$

17. $y = 2(x+2)(x+6)$ Axis: $x=-4$
 X-int: $-2, -6$
 V: $\frac{-2+(-6)}{2} = \frac{-8}{2} = -4$
 $2(-4+2)(-4+6) \Rightarrow 2(-2)(2) \Rightarrow -8$
 $(-4, -8)$

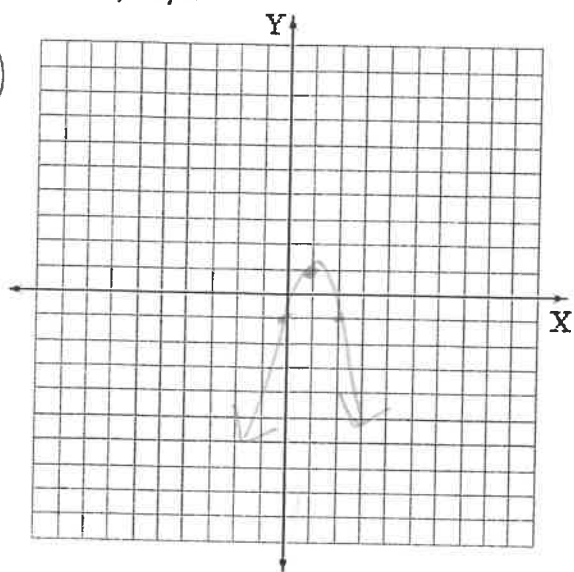
18. $F(x) = 2(x-5)(x-1)$
 X-int: $5, 1$
 V: $\frac{5+1}{2} = \frac{6}{2} = 3$
 $2(3-5)(3-1) \Rightarrow 2(-2)(2) \Rightarrow -8$
 $(3, -8)$

19. $g(x) = -x(x+6)$
 X-int: $0, -6$
 V: $\frac{0+(-6)}{2} = \frac{-6}{2} = -3$
 $-(-3)(-3+6) \Rightarrow 3(3) \Rightarrow 9$
 $(-3, 9)$
 Axis: $x=-3$

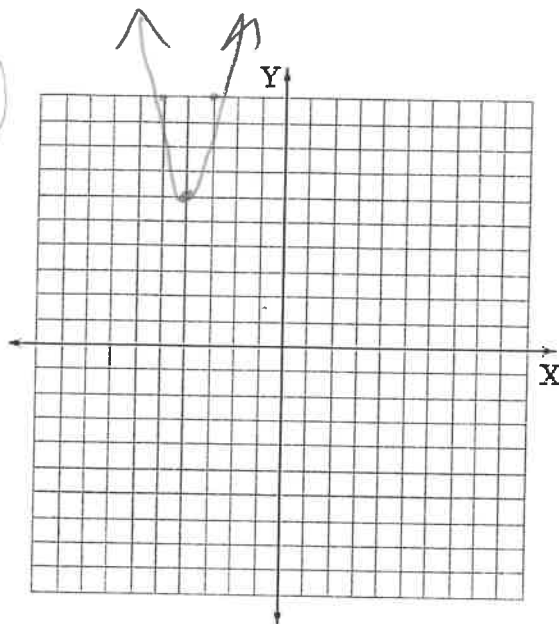
20. $y = -4x(x+7)$
 X-int: $0, -7$
 V: $\frac{0+(-7)}{2} = \frac{-7}{2}$
 $-4(-\frac{7}{2})(-\frac{7}{2}+7) \Rightarrow 14(\frac{7}{2}) = 49$
 $(-\frac{7}{2}, 49)$
 Axis: $x = -\frac{7}{2}$

College Algebra – Chapter 1
Lesson 2, Day 2

7



8



College Algebra – Chapter 1

Lesson 2, Day 2

21. $g(x) = -2(x - 3)^2$

X-int: $3 + 3$

V: $\frac{3+3}{2} = \frac{6}{2} = 3$

$-2(3-3)^2 \Rightarrow -2(0)^2 = 0$

$(3, 0)$

Axis: $x = 3$

Identify the x-intercepts of the function and describe where the graph is increasing and decreasing. If possible, use a graphing calculator to verify your answer.

23. $y = \frac{1}{2}(x - 2)(x + 6)$

X-int: $2, -6$

 $a > 0$, opens up 

$\frac{2-6}{2} = \frac{-4}{2} = -2$

dec $x < -2$

inc $x > -2$

25. $f(x) = -4(x - 4)(x - 2)$

X-int: $4, 2$

 $a < 0$, opens down

$\frac{4+2}{2} = \frac{6}{2} = 3$

dec $x > 3$

inc $x < 3$

27. Compare the graphs of the three quadratic functions. What do you notice? Rewrite the functions f and g in standard form to justify your answer.

$f(x) = (x + 3)(x + 1)$

$g(x) = (x + 2)^2 - 1$

$h(x) = x^2 + 4x + 3$

22. $y = 4(x - 7)^2$

X-int: $7 + 7$

V: $\frac{7+7}{2} = \frac{14}{2} = 7$

$4(7-7)^2 \Rightarrow 4(0)^2 = 0$

$(7, 0)$

Axis: $x = 7$

24. $y = \frac{3}{4}(x + 1)(x - 3)$

X-int: $-1, 3$

 $a > 0$, opens up

$\frac{-1+3}{2} = \frac{2}{2} = 1$

dec $x < 1$

inc $x > 1$

26. $H(x) = -5(x + 5)(x + 1)$

X-int: $-5, -1$

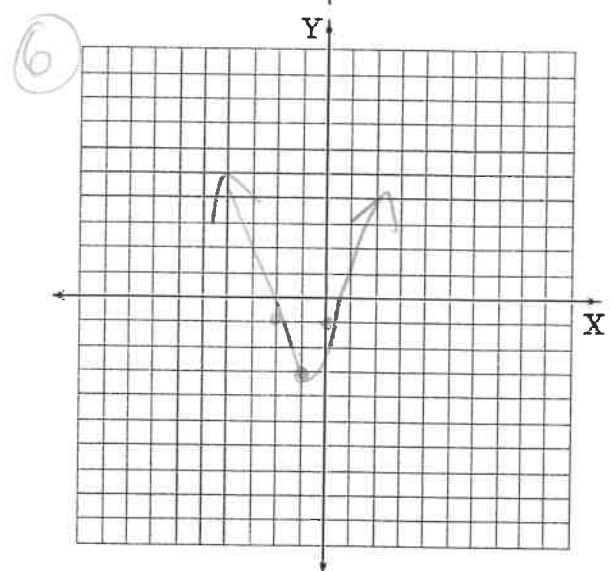
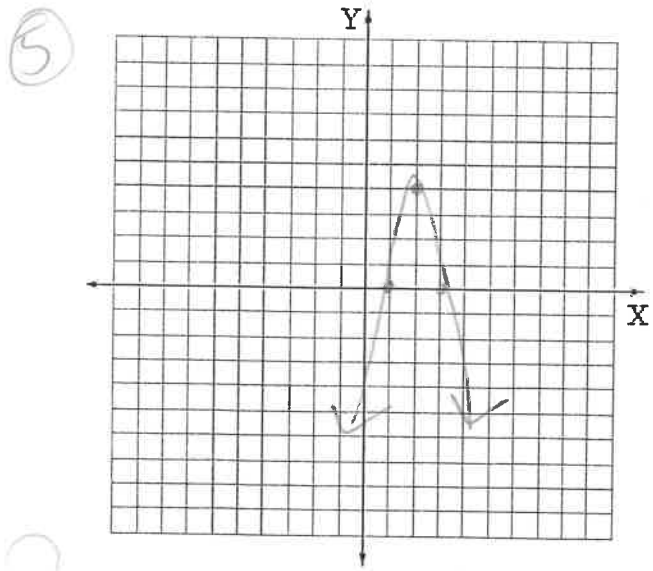
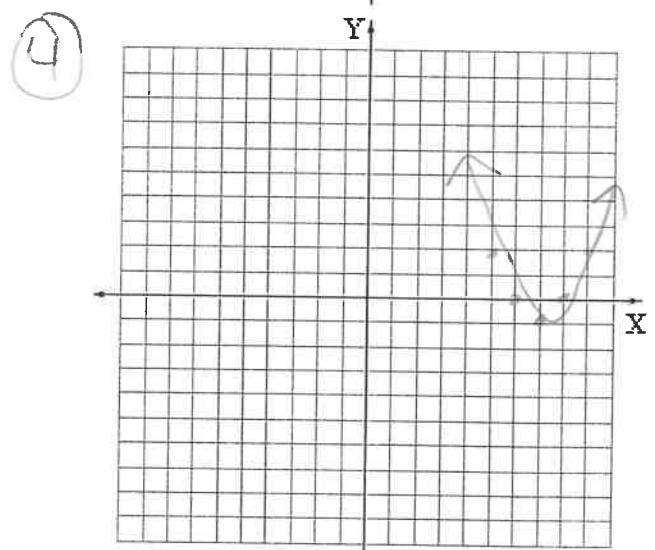
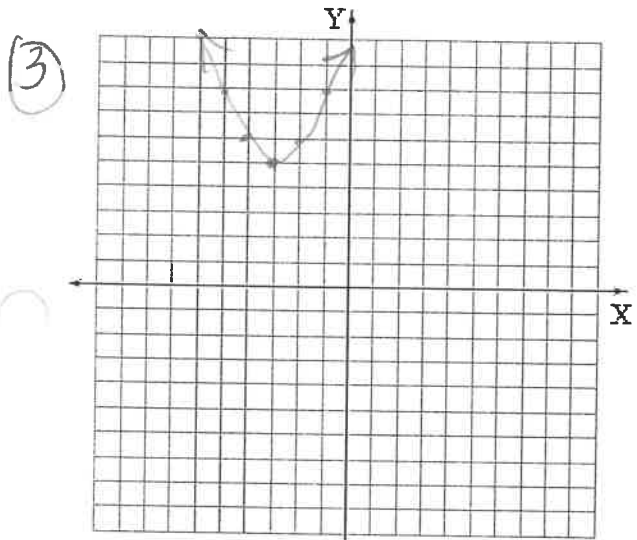
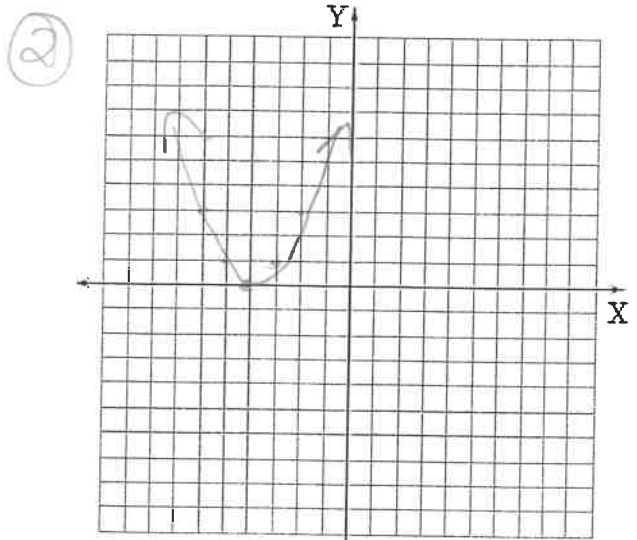
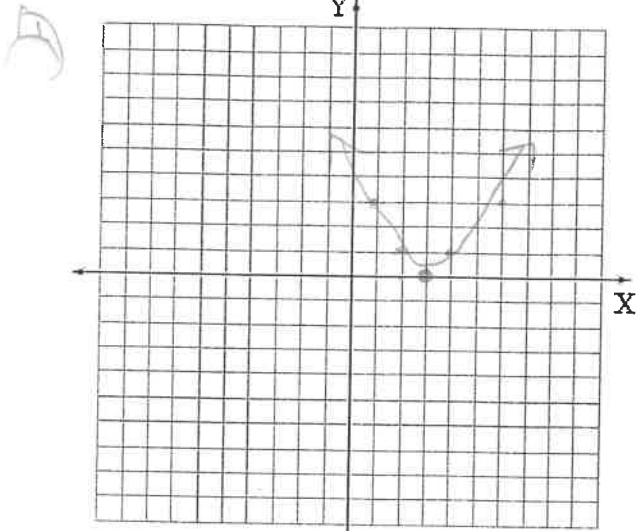
 $a < 0$, opens down

$\frac{-5-1}{2} = \frac{-6}{2} = -3$

dec $x > -3$

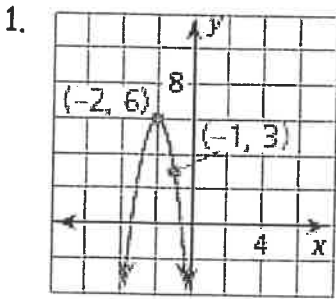
inc $x < -3$

College Algebra – Chapter 1
Lesson 2, Day 2



Name _____

Write an equation of the parabola in vertex form.



$V: -2, 6$
 $y = a(x+2)^2 + 6$
 $3 = a(-1+2)^2 + 6$
 $3 = a(1)^2 + 6$
 $3 = a + 6$
 $-3 = a$

$y = -3(x+2)^2 + 6$

3. passes through (13, 8); vertex (3, 2)

$y = a(x-3)^2 + 2$
 $8 = a(13-3)^2 + 2$
 $8 = a(10)^2 + 2$
 $6 = 100a$
 $\frac{6}{100} = \frac{3a}{100}$
 $\frac{3}{50} = a$

$y = \frac{3}{50}(x-3)^2 + 2$

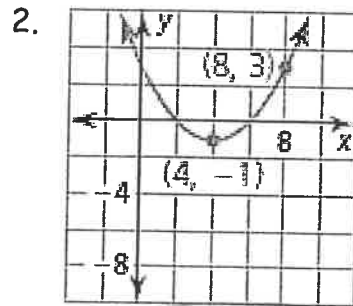
5. passes through (0, -24) vertex (-6, -12)

$y = a(x+6)^2 - 12$
 $-24 = a(0+6)^2 - 12$
 $-24 = a(6)^2 - 12$
 $-24 = 36a - 12$
 $-12 = 36a$
 $-\frac{12}{36} = \frac{36a}{36}$
 $-\frac{1}{3} = a$

$y = -\frac{1}{3}(x+6)^2 - 12$

Write an equation of the parabola in intercept form.

7.



$V: 4, -1$
 $y = a(x-4)^2 - 1$
 $3 = a(8-4)^2 - 1$
 $3 = a(4)^2 - 1$
 $3 = 16a - 1$
 $4 = 16a$
 $\frac{4}{16} = \frac{16a}{16}$
 $\frac{1}{4} = a$

$y = \frac{1}{4}(x-4)^2 - 1$

4. Passes through (-7, -15) vertex (-5, 9)

$y = a(x+7)^2 - 15$
 $9 = a(-5+7)^2 - 15$
 $9 = a(2)^2 - 15$
 $24 = 4a$
 $6 = a$

$y = 6(x+7)^2 - 15$

6. Passes through (6, 35) vertex (-1, 14)

$y = a(x+1)^2 + 14$
 $35 = a(6+1)^2 + 14$
 $21 = 49a$
 $\frac{21}{49} = \frac{49a}{49}$
 $\frac{3}{7} = a$

$y = \frac{3}{7}(x+1)^2 + 14$

8.

College Algebra – Chapter 1

Lesson 3

9. x-intercepts 12, -6; passes through (14, 4)

$$y = a(x-12)(x+6)$$

$$4 = a(14-12)(14+6)$$

$$4 = a(2)(20)$$

$$\frac{4}{40} = \frac{40a}{40}$$

$$\frac{1}{10} = a$$

$$y = \frac{1}{10}(x-12)(x+6)$$

11. x-intercepts -16, -2; passes through (-18, 72)

$$y = a(x+16)(x+2)$$

$$72 = a(-18+16)(-18+2)$$

$$72 = a(-2)(-16)$$

$$\frac{72}{32} = \frac{32a}{32}$$

$$\frac{9}{4} = a$$

$$y = \frac{9}{4}(x+16)(x+2)$$

10. x-intercepts 9, 1; passes through (0, -18)

$$y = a(x-9)(x-1)$$

$$-18 = a(0-9)(0-1)$$

$$-18 = a(-9)(-1)$$

$$\frac{-18}{9} = \frac{9a}{9}$$

$$-2 = a$$

$$y = -2(x-9)(x-1)$$

12. x-intercepts -7, -3; passes through (-2, 0.05)

$$y = a(x+7)(x+3)$$

$$\frac{1}{20} = a(-2+7)(-2+3)$$

$$\frac{1}{20} = a(5)(1)$$

$$\frac{1}{20} = \frac{5a}{5}$$

$$\frac{1}{20} \cdot \frac{1}{5} = \frac{1}{100}$$

$$\frac{1}{100} = a$$

$$y = \frac{1}{100}(x+7)(x+3)$$

College Algebra – Chapter 2
Lesson 0, Day 1

Name: _____

Date _____

Factor the polynomial.

1. $x^2 + 8x + 7$
 $(x+7)(x+1)$

2. $x^2 + 10x + 21$
 $(x+7)(x+3)$

3. $n^2 + 9n + 20$
 $(n+5)(n+4)$

4. $x^2 + 11x + 30$
 $(x+5)(x+6)$

5. $h^2 + 11h + 18$
 $(h+9)(h+2)$

6. $y^2 + 13y + 40$
 $(y+8)(y+5)$

7. $v^2 - 5v + 4$
 $(v-4)(v-1)$

8. $x^2 - 13x + 22$
 $(x-2)(x-11)$

9. $d^2 - 5d + 6$
 $(d-3)(d-2)$

10. $k^2 - 10k + 24$
 $(k-6)(k-4)$

College Algebra – Chapter 2

Lesson 0, Day 1

11. $w^2 - 17w + 72$

$$(w-9)(w-8)$$

12. $j^2 - 13j + 42$

$$(j-7)(j-6)$$

13. $x^2 + 3x - 4$

$$(x+4)(x-1)$$

14. $x^2 - 7x - 18$

$$(x-9)(x+2)$$

15. $n^2 + 4n - 12$

$$(n+6)(n-2)$$

16. $x^2 + 3x - 40$

$$(x+8)(x-5)$$

17. $y^2 + 2y - 48$

$$(y+8)(y-6)$$

18. $h^2 + 6h - 27$

$$(h+9)(h-3)$$

19. $x^2 - x - 20$

$$(x-5)(x+4)$$

20. $m^2 - 6m - 7$

$$(m-7)(m+1)$$

21. $-6x - 16 + x^2$

$$x^2 - 6x - 16$$
$$(x-8)(x+2)$$

22. $-7y + y^2 - 30$

$$y^2 - 7y - 30$$
$$(y-10)(y+3)$$

College Algebra – Chapter 2

Lesson 0, Day 1

Solve the equation.

23. $m^2 + 3m + 2 = 0$

$(m+2)=0$ $m+1=0$

$m = -2$ $m = -1$

24. $n^2 - 9n + 18 = 0$

$n-6=0$ $n-3=0$

$n=6$ $n=3$

25. $x^2 + 5x - 14 = 0$

$x+7=0$ $x-2=0$

$x = -7$ $x = 2$

26. $v^2 + 11v - 26 = 0$

$v+13=0$ $v-2=0$

$v = -13$ $v = 2$

27. $t^2 + 15t = -36$

$t^2 + 15t + 36 = 0$

$t+12=0$ $t+3=0$

$t = -12$ $t = -3$

28. $n^2 - 5n = 24$

$n^2 - 5n - 24 = 0$

$n-8=0$ $n+3=0$

$n = 8$ $n = -3$

29. $a^2 + 5a - 20 = 30$

$a^2 + 5a - 50 = 0$

$a+10=0$ $a-5=0$

$a = -10$ $a = 5$

30. $y^2 - 2y - 8 = 7$

$y^2 - 2y - 15 = 0$

$y-5=0$ $y+3=0$

$y = 5$ $y = -3$

31. $m^2 + 10m = 15m - 34$

$-5m + 34 - 15m + 34$

$m^2 - 5m + 34 = 0$

Not Possible

32. $b^2 + 5 = 8b - 10$

$b^2 - 8b + 15 = 0$

$b-5=0$ $b-3=0$

$b = 5$ $b = 3$

College Algebra – Chapter 2
Lesson 0, Day 2

Name: _____

Date _____

Factor the polynomial.

1. $3x^2 + 3x - 6$

$$3(x^2 + x - 2)$$
$$3(x-1)(x+2)$$

2. $8x^2 + 8x - 48$

$$8(x^2 + x - 6)$$
$$8(x+3)(x-2)$$

3. $4k^2 + 28k + 48$

$$4(k^2 + 7k + 12)$$
$$4(k+4)(k+3)$$

4. $6y^2 - 24y + 18$

$$6(y^2 - 4y + 3)$$
$$6(y-3)(y-1)$$

5. $7x^2 - 63x + 140$

$$7(x^2 - 9x + 20)$$
$$7(x-4)(x-5)$$

6. $9x^2 - 36x - 45$

$$9(x^2 - 4x - 5)$$
$$9(x-5)(x+1)$$

7. $3h^2 + 11h + 6$

$$(3h+2)(h+3)$$

8. $8m^2 + 30m + 7$

$$(2m+7)(4m+1)$$

College Algebra – Chapter 2

Lesson 0, Day 2

9. $6x^2 - 5x + 1$
 $(2x - 1)(3x - 1)$

10. $10x^2 - 31x + 15$
 $(2x - 5)(5x - 3)$

11. $3n^2 + 5n - 2$
 $(n + 2)(3n - 1)$

12. $4x^2 + 4x - 3$
 $(2x + 3)(2x - 1)$

13. $8x^2 - 10x - 12$
 $2(4x^2 - 5x - 6)$
 $2(x - 2)(4x + 3)$

14. $18x^2 - 15x - 18$
 $3(6x^2 - 5x - 6)$
 $3(2x - 3)(3x + 2)$

15. $-3x^2 + 11x - 6$
 $3x^2 - 11x + 6$
 $(3x - 2)(x - 3)$

16. $-7x^2 - 25x - 12$
 $7x^2 + 25x + 12$
 $(7x + 4)(x + 3)$

College Algebra – Chapter 2

Lesson 0, Day 2

17. $-4x^2 + 19x + 5$

$$4x^2 - 19x - 5$$

$$-(x - 5)(4x + 1)$$

18. $-8x^2 - 13x + 6$

$$-8x^2 + 13x - 6$$

$$(1x + 2)(8x - 3)$$

19. $-15y^2 - y + 28$

$$15y^2 + y - 28$$

$$(5y + 7)(3y - 4)$$

20. $-22x^2 + 29x - 9$

$$22x^2 - 29x + 9$$

$$-(11x - 9)(2x - 1)$$

Solve the equation.

21. $5x^2 - 5x - 30 = 0$

$$5(x^2 - x - 6) = 0$$

$$5(x - 3)(x + 2) = 0$$

$$5 \neq 0 \quad x - 3 = 0 \quad x + 2 = 0$$

$$x = 3 \quad x = -2$$

22. $2k^2 - 5k - 18 = 0$

$$(2k - 9)(k + 2) = 0$$

$$2k - 9 = 0 \quad k + 2 = 0$$

$$\frac{2k}{2} = \frac{9}{2} \quad k = -2$$

$$k = \frac{9}{2}$$

23. $-12n^2 - 11n = -15$

$$-12n^2 - 11n + 15 = 0$$

$$12n^2 + 11n - 15 = 0$$

$$(4n - 3)(3n + 5) = 0$$

$$4n - 3 = 0 \quad 3n + 5 = 0$$

$$4n = 3 \quad 3n = -5$$

$$n = \frac{3}{4} \quad n = -\frac{5}{3}$$

24. $14x^2 - 2 = -3x$

$$14x^2 + 3x - 2 = 0$$

$$(7x - 2)(2x + 1) = 0$$

$$7x - 2 = 0 \quad 2x + 1 = 0$$

$$7x = 2 \quad 2x = -1$$

$$x = \frac{2}{7} \quad x = -\frac{1}{2}$$

Name _____

Solve the equation using square roots.

$$1. X^2 = 144$$

$$X = \pm\sqrt{144}$$

$$X = \pm 12$$

$$2. A^2 = 81$$

$$A = \pm\sqrt{81}$$

$$A = \pm 9$$

$$3. (z - 6)^2 = 25$$

$$(z - 6) = \pm\sqrt{25}$$

$$z - 6 = \pm 5$$

$$\begin{array}{l} z - 6 = +5 \\ +6 \quad +6 \end{array}$$

$$z = 5 + 6 \quad z = -5 + 6$$

$$z = 11 \quad z = 1$$

$$4. (p - 4)^2 = 49$$

$$p - 4 = \pm\sqrt{49}$$

$$p - 4 = \pm 7$$

$$\begin{array}{l} p - 4 = +7 \\ +4 \quad +4 \end{array}$$

$$p = 7 + 4 \quad p = -7 + 4$$

$$p = 11 \quad p = -3$$

$$5. 4(x - 1)^2 + 2 = 10$$

$$\frac{4(x-1)^2}{4} = \frac{8}{4}$$

$$(x - 1)^2 = 2$$

$$x - 1 = \pm\sqrt{2}$$

$$\begin{array}{l} +1 \quad +1 \end{array}$$

$$x = 1 \pm \sqrt{2}$$

$$6. 2(x + 2)^2 - 5 = 8$$

$$\frac{2(x+2)^2}{2} = \frac{13}{2}$$

$$(x + 2)^2 = \frac{13}{2}$$

$$x + 2 = \pm\sqrt{\frac{13}{2}}$$

$$x = -2 \pm \sqrt{\frac{13}{2}}$$

$$7. \frac{1}{2}r^2 - 10 = \frac{3}{2}r^2$$

$$\begin{array}{l} -\frac{3}{2}r^2 \quad -\frac{3}{2}r^2 \\ -\frac{1}{2}r^2 \end{array}$$

$$-r^2 - 10 = 0$$

$$-r^2 = 10$$

$$r^2 = -10$$

No Sol

$$8. \frac{1}{5}x^2 + 2 = \frac{3}{5}x^2$$

$$\begin{array}{l} -\frac{3}{5}x^2 \quad -\frac{3}{5}x^2 \\ -\frac{2}{5}x^2 \end{array}$$

$$-\frac{2}{5}x^2 + 2 = 0$$

$$\left(-\frac{5}{2}\right) \cdot \frac{2}{5}x^2 = -2 \left(-\frac{5}{2}\right)$$

$$x^2 = 5$$

$$x = \pm\sqrt{5}$$

Describe and correct the error in solving the equation.

9. ~~X~~

$$2(x + 1)^2 + 3 = 21$$

$$2(x + 1)^2 = 18$$

$$(x + 1)^2 = 9$$

$$x + 1 = 3 \rightarrow \text{didn't do } \pm$$

$$x = 2$$

10. ~~X~~

$$-2x^2 - 8 = 0$$

$$-2x^2 = 8 \rightarrow \text{can't have -}$$

$$x^2 = -4$$

$$x = \pm 2$$

No Sol

College Algebra – Chapter 2

Lesson 1, Day 2

Name _____

Solve the equation by factoring.

1. $0 = x^2 + 6x + 9$

$(x+3)(x+3) = 0$

$x+3 = 0$

$x = -3$

2. $0 = z^2 - 10z + 25$

$(z-5)(z-5) = 0$

$z-5 = 0$

$z = 5$

3. $x^2 - 8x = -12$

$x^2 - 8x + 12 = 0$

$(x-6)(x-2) = 0$

$x-6 = 0$ $x-2 = 0$

$x = 6$ $x = 2$

4. $x^2 - 11x = -30$

$x^2 - 11x + 30 = 0$

$(x-6)(x-5) = 0$

$x-6 = 0$ $x-5 = 0$

$x = 6$ $x = 5$

5. $n^2 - 6n = 0$

$n(n-6) = 0$

$n = 0$ $n-6 = 0$

$n = 6$

6. $a^2 - 49 = 0$

$(a-7)(a+7) = 0$

$a-7 = 0$ $a+7 = 0$

$a = 7$ $a = -7$

7. $2w^2 - 16w = 12w - 48$

$-12w + 48 - 12w + 48$

$2w^2 - 28w + 48 = 0$

$2(w^2 - 14w + 24) = 0$

$2(w-12)(w-2) = 0$

$2 \neq 0$ $w-12 = 0$ $w-2 = 0$

$w = 12$ $w = 2$

8. $-y + 28 + y^2 = 2y + 2y^2$

$-2y$ $-2y^2 - 2y - 2y^2$

$-y^2 - 3y + 28 = 0$

$y^2 + 3y - 28 = 0$

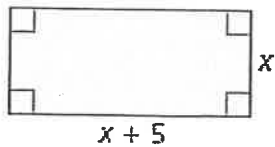
$(y+7)(y-4) = 0$

$y+7 = 0$ $y-4 = 0$

$y = -7$ $y = 4$

Find the value of x.

9. Area of rectangle = 36



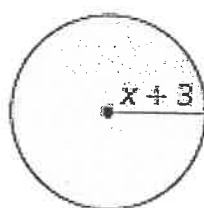
$x(x+5) = 36$

$x^2 + 5x - 36 = 0$

$(x+9)(x-4) = 0$

~~$x = -9$~~ $x = 4$

10. Area of circle = 25π



$\frac{\pi(x+3)^2}{\pi} = \frac{25\pi}{\pi}$

$(x+3)^2 = 25$

$x+3 = \pm\sqrt{25}$

$x+3 = \pm 5$

$x+3 = 5$

~~$x+3 = -5$~~

$x = 2$

~~$x = -8$~~

College Algebra – Chapter 2

Lesson 1, Day 2

Solve the equation using any method.

11. $u^2 = -9u$
 $+9u \quad +9u$

$u^2 + 9u = 0$
 $u(u+9) = 0$
 $u = 0$ $u+9 = 0$
 $u = -9$

13. $-(x+9)^2 = 64$

$(x+9)^2 = -64$

No Sol

12. $\frac{t^2}{20} + 8 = 15$
 $-8 \quad -3$

$20 \cdot \frac{t^2}{20} = 7 \cdot 20$
 $t^2 = 140$
 $t = \pm \sqrt{140}$

14. $-2(x+2)^2 = 5$
 $-2 \quad -2$

$(x+2)^2 = -\frac{5}{2}$

No Sol

15. $7(x-4)^2 - 18 = 10$
 $+18 \quad +18$

$7(x-4)^2 = 28$

$(x-4)^2 = 4$

$x-4 = \pm \sqrt{4}$

$x-4 = \pm 2$

$x-4 = 2$
 $x = 6$

$x-4 = -2$
 $x = 2$

16. $-t^2 + 8t + 16 = 0$
 $(t+4)^2 = 0$

$t+4 = 0$
 $t = -4$

Find the zero(s) of the function.

17. $G(x) = x^2 + 6x + 8$

$(x+4)(x+2) = 0$

$x+4 = 0$ $x+2 = 0$

$x = -4$

$x = -2$

18. $F(x) = x^2 - 8x + 16$

$(x-4)(x-4) = 0$

$x-4 = 0$

$x = 4$

19. $h(x) = x^2 + 7x - 30$

$(x+10)(x-3) = 0$

$x+10 = 0$ $x-3 = 0$

$x = -10$

$x = 3$

20. $G(x) = x^2 + 11x$

$x^2 + 11x = 0$

$x(x+11) = 0$

$x = 0$

$x+11 = 0$
 $x = -11$

College Algebra - Chapter 2

Lesson 1, Day 2

21. $f(x) = 2x^2 - 2x - 12$

$$2x^2 - 2x - 12 = 0$$

$$2(x^2 - x - 6) = 0$$

$$2(x-3)(x+2) = 0$$

$$2 \neq 0 \quad x-3=0 \quad x+2=0$$

$$\boxed{x=3} \quad \boxed{x=-2}$$

23. $g(x) = x^2 + 22x + 121$

$$(x+11)^2 = 0$$

$$x+11=0$$

$$\boxed{x=-11}$$

22. $F(x) = 4x^2 - 12x + 9$

$$(2x-3)(2x-3) = 0$$

$$2x-3=0$$

$$2x=3$$

$$\boxed{x=\frac{3}{2}}$$

24. $H(x) = x^2 + 19x + 84$

$$(x+12)(x+7) = 0$$

$$x+12=0 \quad x+7=0$$

$$\boxed{x=-12}$$

$$\boxed{x=-7}$$

College Algebra – Chapter 2

Lesson 2, Day 1

Name _____

Find the square root of the number.

1. $\sqrt{-36}$

$6i$

2. $\sqrt{-64}$

$8i$

3. $\sqrt{-18}$

$3i\sqrt{2}$

4. $\sqrt{-24}$

$2i\sqrt{6}$

5. $2\sqrt{-16}$

$2(4i)$

$8i$

6. $-3\sqrt{-49}$

$-3(7i)$

$-21i$

7. $-4\sqrt{-32}$

$-4(4i)\sqrt{2}$
 $-16i\sqrt{2}$

8. $6\sqrt{-63}$

$6(3i)\sqrt{7}$

$18i\sqrt{7}$

Find the values of x and y that satisfy the equation.

9. $4x + 2i = 8 + yi$

$\frac{4x}{4} = \frac{8}{4}$

$\frac{2i}{i} = \frac{yi}{i}$

$x = 2$

$2 = y$

10. $3x + 6i = 27 + yi$

$\frac{3x}{3} = \frac{27}{3}$

$\frac{6i}{i} = \frac{yi}{i}$

$x = 9$

$6 = y$

College Algebra - Chapter 2

Lesson 2, Day 1

11. $-10x + 12i = 20 + 3yi$

$$\frac{-10x}{-10} = \frac{20}{-10} \quad \frac{12i}{3i} = \frac{3yi}{3i}$$

$$x = -2 \quad 4 = y$$

12. $9x - 18i = -36 + 6yi$

$$\frac{9x}{9} = \frac{-36}{9} \quad \frac{-18i}{6i} = \frac{6yi}{6i}$$

$$x = -4 \quad -3 = y$$

13. $2x - yi = 14 + 12i$

$$\frac{2x}{2} = \frac{14}{2} \quad \frac{-yi}{-i} = \frac{12i}{-i}$$

$$x = 7 \quad y = -12$$

14. $-12x + yi = 60 - 13i$

$$\frac{-12x}{-12} = \frac{60}{-12} \quad \frac{yi}{i} = \frac{-13i}{i}$$

$$x = -5 \quad y = -13$$

Add or subtract. Write the answer in standard form.

15. $(6 - i) + (7 + 3i)$

$$(6+7) + (-i+3i)$$

$$13 + 2i$$

16. $(9 + 5i) + (11 + 2i)$

$$(9+11) + (5i+2i)$$

$$20 + 7i$$

17. $(12 + 4i) - (3 - 7i)$

$$(12-3) + (4i+7i)$$

$$9 + 11i$$

18. $(2 - 15i) - (4 + 5i)$

$$(2-4) + (-15i-5i)$$

$$-2 - 20i$$

19. $(12 - 3i) + (7 + 3i)$

$$(12+7) + (-3i+3i)$$

$$19$$

20. $(16 - 9i) - (2 - 9i)$

$$(16-2) + (-9i+9i)$$

$$14$$

Name _____

Multiply. Write the answer in standard form.

1. $3i(-5 + i)$

$$\begin{aligned} & -15i + 3i^2 \\ & -15i + 3(-1) \end{aligned}$$

$$\boxed{-3 - 15i}$$

2. $2i(7 - i)$

$$\begin{aligned} & 14i - 2i^2 \\ & 14i - 2(-1) \end{aligned}$$

$$\boxed{2 + 14i}$$

3. $(3 - 2i)(4 + i)$

$$12 + 3i - 8i - 2i^2$$

$$12 - 5i - 2(-1)$$

$$12 - 5i + 2$$

$$\boxed{14 - 5i}$$

4. $(7 + 5i)(8 - 6i)$

$$56 - 42i + 40i - 30i^2$$

$$56 - 2i - 30(-1)$$

$$56 - 2i + 30$$

$$\boxed{86 - 2i}$$

5. $(4 - 2i)(4 + 2i)$

$$16 + 8i - 8i - 4i^2$$

$$16 - 4(-1)$$

$$16 + 4$$

$$\boxed{20}$$

6. $(9 + 5i)(9 - 5i)$

$$81 - 45i + 45i - 25i^2$$

$$81 - 25(-1)$$

$$81 + 25$$

$$\boxed{106}$$

7. $(3 - 6i)^2 \rightarrow (3 - 6i)(3 - 6i)$

$$9 - 18i - 18i + 36i^2$$

$$9 - 36i + 36(-1)$$

$$9 - 36i - 36$$

$$\boxed{-27 - 36i}$$

8. $(8 + 3i)^2 \rightarrow (8 + 3i)(8 + 3i)$

$$64 + 24i + 24i + 9i^2$$

$$64 + 48i + 9(-1)$$

$$64 + 48i - 9$$

$$\boxed{55 + 48i}$$

Place the tiles in the expression to make a true statement.

9. $(6 - 3i) - (4 - 7i) = 2 - 4i$

7

~~4~~

3

~~6~~

10. $2i(-5 + 9i) = -18 - 10i$

-5

9

2

Solve the equation. Check your solution(s).

11. $x^2 + 9 = 0$

$$\sqrt{x^2} = \sqrt{-9}$$

$$x = \pm \sqrt{-9}$$

$$x = \pm 3i$$

12. $x^2 + 49 = 0$

$$\sqrt{x^2} = \sqrt{-49}$$

$$x = \pm \sqrt{-49}$$

$$x = \pm 7i$$

13. $x^2 - 4 = -11$

$$\begin{array}{r} +4 \quad +4 \\ x^2 = -7 \end{array}$$

$$x = \pm \sqrt{-7}$$

$$x = \pm i\sqrt{7}$$

$$x = \pm i\sqrt{7}$$

14. $x^2 - 9 = -15$

$$\begin{array}{r} +9 \quad +9 \\ x^2 = -6 \end{array}$$

$$x = \pm \sqrt{-6}$$

$$x = \pm i\sqrt{6}$$

$$x = \pm i\sqrt{6}$$

15. $2x^2 + 6 = -34$

$$\begin{array}{r} -6 \quad -6 \\ 2x^2 = -40 \end{array}$$

$$\frac{2x^2}{2} = \frac{-40}{2}$$

$$x^2 = -20$$

$$x = \pm \sqrt{-20}$$

$$x = \pm i\sqrt{4}\sqrt{5}$$

$$x = \pm 2i\sqrt{5}$$

16. $x^2 + 7 = -47$

$$\begin{array}{r} -7 \quad -7 \\ x^2 = -54 \end{array}$$

$$x = \pm \sqrt{-54}$$

$$x = \pm i\sqrt{9}\sqrt{6}$$

$$x = \pm 3i\sqrt{6}$$

$$x = \pm 3i\sqrt{6}$$

Find the zeros of the function.

17. $F(x) = 3x^2 + 6$

$$3x^2 + 6 = 0$$

$$\begin{array}{r} -6 \quad -6 \\ 3x^2 = -6 \end{array}$$

$$\frac{3x^2}{3} = \frac{-6}{3}$$

$$x^2 = -2$$

$$x = \pm \sqrt{-2}$$

$$x = \pm i\sqrt{2}$$

18. $G(x) = 7x^2 + 21$

$$7x^2 + 21 = 0$$

$$\begin{array}{r} -21 \quad -21 \\ 7x^2 = -21 \end{array}$$

$$\frac{7x^2}{7} = \frac{-21}{7}$$

$$x^2 = -3$$

$$x = \pm \sqrt{-3}$$

$$x = \pm i\sqrt{3}$$

19. $h(x) = 2x^2 + 72$

$$2x^2 + 72 = 0$$

$$\begin{array}{r} -72 \quad -72 \\ 2x^2 = -72 \end{array}$$

$$\frac{2x^2}{2} = \frac{-72}{2}$$

$$x^2 = -36$$

$$x = \pm \sqrt{-36}$$

$$x = \pm 6i$$

20. $K(x) = -5x^2 - 125$

$$-5x^2 - 125 = 0$$

$$\begin{array}{r} +125 \quad +125 \\ -5x^2 = 125 \end{array}$$

$$\frac{-5x^2}{-5} = \frac{125}{-5}$$

$$x^2 = -25$$

$$x = \pm \sqrt{-25}$$

$$x = \pm 5i$$

Name _____

Solve the equation using square roots. Check your solution(s).

1. $X^2 - 8x + 16 = 25$

$$(x-4)^2 = 25$$

$$x-4 = \pm\sqrt{25}$$

$$x-4 = \pm 5$$

$$\begin{array}{l} +4 \\ +4 \end{array}$$

$$x = 5+4 \quad x = -5+4$$

$$\boxed{x=9}$$

$$\boxed{x=-1}$$

3. $x^2 - 18x + 81 = 5$

$$(x-9)^2 = 5$$

$$x-9 = \pm\sqrt{5}$$

$$\begin{array}{l} +9 \\ +9 \end{array}$$

$$\boxed{x = 9 \pm \sqrt{5}}$$

5. $y^2 - 24y + 144 = -100$

$$(y-12)^2 = -100$$

$$y-12 = \pm\sqrt{-100}$$

$$y-12 = \pm 10i$$

$$\begin{array}{l} +12 \\ +12 \end{array}$$

$$\boxed{y = 12 \pm 10i}$$

7. $4w^2 + 4w + 1 = 75$

$$(2w+1)^2 = 75$$

$$2w+1 = \pm\sqrt{75}$$

$$2w+1 = \pm\sqrt{25}\sqrt{3}$$

$$2w+1 = \pm 5\sqrt{3}$$

$$\begin{array}{l} -1 \\ -1 \end{array}$$

$$2w = -1 \pm 5\sqrt{3}$$

$$\boxed{w = \frac{-1 \pm 5\sqrt{3}}{2}}$$

2. $R^2 - 10r + 25 = 1$

$$(r-5)^2 = 1$$

$$r-5 = \pm\sqrt{1}$$

$$r-5 = \pm 1$$

$$\begin{array}{l} +5 \\ +5 \end{array}$$

$$r = 1+5$$

$$r = -1+5$$

$$\boxed{r=6}$$

$$\boxed{r=4}$$

4. $M^2 + 8m + 16 = 45$

$$(m+4)^2 = 45$$

$$m+4 = \pm\sqrt{45}$$

$$m+4 = \pm\sqrt{9}\sqrt{5}$$

$$m+4 = \pm 3\sqrt{5}$$

$$\begin{array}{l} -4 \\ -4 \end{array}$$

$$\boxed{m = -4 \pm 3\sqrt{5}}$$

6. $X^2 - 26x + 169 = -13$

$$(x-13)^2 = -13$$

$$(x-13) = \pm\sqrt{-13}$$

$$x-13 = \pm i\sqrt{13}$$

$$\begin{array}{l} +13 \\ +13 \end{array}$$

$$\boxed{x = 13 \pm i\sqrt{13}}$$

8. $4x^2 - 8x + 4 = 1$

$$(2x-2)^2 = 1$$

$$2x-2 = \pm\sqrt{1}$$

$$2x-2 = \pm 1$$

$$\begin{array}{l} +2 \\ +2 \end{array}$$

$$2x = 1+2$$

$$2x = 3$$

$$\boxed{x = \frac{3}{2}}$$

$$2x = -1+2$$

$$2x = 1$$

$$\boxed{x = \frac{1}{2}}$$

Find the value of c that makes the expression a perfect square trinomial. Then write the expression as the square of a binomial.

9. $x^2 + 10x + c$

$$c = \left(\frac{10}{2}\right)^2 \Rightarrow (5)^2 = \boxed{25}$$

$$(x+5)^2$$

10. $x^2 + 20x + c$

$$c = \left(\frac{20}{2}\right)^2 \Rightarrow (10)^2 = \boxed{100}$$

$$(x+10)^2$$

College Algebra – Chapter 2

Lesson 3

11. $y^2 - 12y + c$
 $c = \left(-\frac{12}{2}\right)^2 \Rightarrow (-6)^2 = 36$
 $(y-6)^2$

12. $T^2 - 22t + c$
 $c = \left(-\frac{22}{2}\right)^2 \Rightarrow (-11)^2 = 121$
 $(t-11)^2$

13. $x^2 - 6x + c$
 $c = \left(-\frac{6}{2}\right)^2 \Rightarrow (-3)^2 = 9$
 $(x-3)^2$

14. $X^2 + 24x + c$
 $c = \left(\frac{24}{2}\right)^2 \Rightarrow (12)^2 = 144$
 $(X+12)^2$

15. $z^2 - 5z + c$
 $c = \left(-\frac{5}{2}\right)^2 \Rightarrow \left(-\frac{5}{2}\right)^2 \Rightarrow \frac{25}{4}$
 $\left(z - \frac{5}{2}\right)^2$

16. $X^2 + 9x + c$
 $c = \left(\frac{9}{2}\right)^2 \Rightarrow \frac{81}{4}$
 $\left(X + \frac{9}{2}\right)^2$

Solve the equation by completing the square.

17. $X^2 + 6x + \frac{3}{2} = 0$
 $\begin{matrix} & -\frac{3}{2} & -\frac{3}{2} \\ X^2 + 6x & = & -\frac{3}{2} \end{matrix}$
 $c = \left(\frac{6}{2}\right)^2 \Rightarrow (3)^2 = 9$
 $X^2 + 6x + 9 = -\frac{3}{2} + 9$
 $(X+3)^2 = 6$
 $X+3 = \pm\sqrt{6}$
 $X = -3 \pm \sqrt{6}$

18. $X^2 + 2x - 6 = 0$
 $\begin{matrix} & +1 & +1 \\ X^2 + 2x & = & 6 \end{matrix}$
 $X^2 + 2x = 6$
 $c = \left(\frac{2}{2}\right)^2 = 1^2 = 1$
 $X^2 + 2x + 1 = 6 + 1$
 $(X+1)^2 = 7$
 $X+1 = \pm\sqrt{7}$
 $X = -1 \pm \sqrt{7}$

College Algebra - Chapter 2

Lesson 3

19. $x^2 + 4x - 2 = 0$

$x^2 + 4x = 2$

$C = (\frac{4}{2})^2 = (2)^2 = 4$

$x^2 + 4x + 4 = 2 + 4$

$(x+2)^2 = 6$

$x+2 = \pm\sqrt{6}$

$x = -2 \pm \sqrt{6}$

21. $z(z+9) = 1$

$z^2 + 9z = 1$

$C = (\frac{9}{2})^2 \Rightarrow \frac{81}{4}$

$z^2 + 9z + \frac{81}{4} = 1 + \frac{81}{4}$

$(z + \frac{9}{2})^2 = \frac{4}{4} + \frac{81}{4}$

$z + \frac{9}{2} = \pm\sqrt{\frac{85}{4}}$

$z + \frac{9}{2} = \pm\sqrt{\frac{85}{4}}$

$z = -\frac{9}{2} \pm \frac{\sqrt{85}}{2}$

23. $7t^2 + 28t + 56 = 0$

$t^2 + 4t + 8 = 0$

$t^2 + 4t = -8$

$C = (\frac{4}{2})^2 = (2)^2 = 4$

$t^2 + 4t + 4 = -8 + 4$

$(t+2)^2 = -4$

$t+2 = \pm\sqrt{-4}$

$t+2 = \pm 2i$

$t = -2 \pm 2i$

25. $5x(x+6) = -50$

$5x^2 + 30x = -50$

$x^2 + 6x = -10$

$C = (\frac{6}{2})^2 = (3)^2 = 9$

$x^2 + 6x + 9 = -10 + 9$

$(x+3)^2 = -1$

$x+3 = \pm\sqrt{-1}$

$x+3 = \pm i$

$x = -3 \pm i$

20. $T^2 - 8T - 5 = 0$

$t^2 - 8t = 5$

$C = (\frac{-8}{2})^2 = (-4)^2 = 16$

$t^2 - 8t + 16 = 5 + 16$

$(t-4)^2 = 21$

$t-4 = \pm\sqrt{21}$

$t = 4 \pm \sqrt{21}$

22. $X(x+8) = -20$

$x^2 + 8x = -20$

$C = (\frac{8}{2})^2 = (4)^2 = 16$

$x^2 + 8x + 16 = -20 + 16$

$(x+4)^2 = -4$

$x+4 = \pm\sqrt{-4}$

$x+4 = \pm 2i$

$x = -4 \pm 2i$

$x = -4 \pm 2i$

24. $6r^2 + 6r + 12 = 0$

$r^2 + r + 2 = 0$

$r^2 + r = -2$

$C = (\frac{1}{2})^2 = \frac{1}{4}$

$r^2 + r + \frac{1}{4} = -2 + \frac{1}{4}$

$(r + \frac{1}{2})^2 = -\frac{7}{4} + \frac{1}{4}$

$r + \frac{1}{2} = \pm\sqrt{-\frac{7}{4}}$

$r + \frac{1}{2} = \pm i\sqrt{\frac{7}{4}}$

$r = -\frac{1}{2} \pm i\sqrt{\frac{7}{4}}$

26. $4x^2 - 30x = 12 + 10x$

$4x^2 - 40x = 12$

$x^2 - 10x = 3$

$C = (\frac{-10}{2})^2 = (-5)^2 = 25$

$x^2 - 10x + 25 = 3 + 25$

$(x-5)^2 = 28$

$x-5 = \pm\sqrt{28}$

$x-5 = \pm\sqrt{7}\sqrt{4}$

$x-5 = \pm 2\sqrt{7}$

$x = 5 \pm 2\sqrt{7}$

College Algebra – Chapter 2

Lesson 3

Write the quadratic function in vertex form. Then identify the vertex.

27. $F(x) = x^2 - 8x + 19$

$$x^2 - 8x + 19 = 0$$

$$x^2 - 8x = -19$$

$$C = \left(\frac{-8}{2}\right)^2 = (-4)^2 = 16$$

$$x^2 - 8x + 16 = -19 + 16$$

$$(x - 4)^2 = -3$$

$$V: (4, -3)$$

28. $G(x) = x^2 - 4x - 1$

$$x^2 - 4x - 1 = 0$$

$$x^2 - 4x = 1$$

$$C = \left(\frac{-4}{2}\right)^2 = (-2)^2 = 4$$

$$x^2 - 4x + 4 = 1 + 4$$

$$(x - 2)^2 = 5$$

$$V: (2, 5)$$

29. $g(x) = x^2 + 12x + 37$

$$x^2 + 12x + 37 = 0$$

$$x^2 + 12x = -37$$

$$C = \left(\frac{12}{2}\right)^2 = (6)^2 = 36$$

$$x^2 + 12x + 36 = -37 + 36$$

$$(x + 6)^2 = -1$$

$$V: (-6, -1)$$

30. $G(x) = x^2 + 20x + 90$

$$x^2 + 20x + 90 = 0$$

$$x^2 + 20x = -90$$

$$C = \left(\frac{20}{2}\right)^2 = (10)^2 = 100$$

$$x^2 + 20x + 100 = -90 + 100$$

$$(x + 10)^2 = 10$$

$$V: (-10, 10)$$

College Algebra – Chapter 2

Lesson 4, Day 1

Name _____

Solve the equation using the Quadratic Formula. If possible, use a graphing calculator to check your solution(s).

1. $x^2 - 4x + 3 = 0$
 $a=1$ $b=-4$ $c=3$

$$\frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(3)}}{2(1)}$$

$$\frac{4 \pm \sqrt{16-12}}{2} \Rightarrow \frac{4 \pm \sqrt{4}}{2}$$

$$\frac{4+2}{2} \Rightarrow \frac{4+2}{2} = 3$$

$$\frac{4-2}{2} \Rightarrow \frac{4-2}{2} = 1$$

2. $3x^2 + 6x + 3 = 0$
 $a=3$ $b=6$ $c=3$

$$\frac{-6 \pm \sqrt{(6)^2 - 4(3)(3)}}{2(3)}$$

$$\frac{-6 \pm \sqrt{36-36}}{6} \Rightarrow \frac{-6 \pm \sqrt{0}}{6} \Rightarrow \frac{-6}{6} = -1$$

3. $x^2 + 6x + 15 = 0$
 $a=1$ $b=6$ $c=15$

$$\frac{-6 \pm \sqrt{(6)^2 - 4(1)(15)}}{2(1)}$$

$$\frac{-6 \pm \sqrt{36-60}}{2}$$

$$\frac{-6 \pm \sqrt{-24}}{2}$$

$$\frac{-6 \pm i\sqrt{4}\sqrt{6}}{2}$$

$$\frac{-6 \pm 2i\sqrt{6}}{2} \Rightarrow -3 \pm i\sqrt{6}$$

4. $6x^2 - 2x + 1 = 0$
 $a=6$ $b=-2$ $c=1$

$$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(6)(1)}}{2(6)}$$

$$\frac{2 \pm \sqrt{4-24}}{12}$$

$$\frac{2 \pm \sqrt{-20}}{12}$$

$$\frac{2 \pm i\sqrt{4}\sqrt{5}}{12}$$

$$\frac{2 \pm 2i\sqrt{5}}{12} \Rightarrow \frac{1 \pm i\sqrt{5}}{6}$$

5. $x^2 - 14x = -49 \Rightarrow x^2 - 14x + 49 = 0$
 $a=1$ $b=-14$ $c=49$

$$\frac{-(-14) \pm \sqrt{(-14)^2 - 4(1)(49)}}{2(1)}$$

$$\frac{14 \pm \sqrt{196-196}}{2}$$

$$\frac{14 \pm \sqrt{0}}{2} \Rightarrow \frac{14}{2} = 7$$

6. $2x^2 + 4x = 30$
 $2x^2 + 4x - 30 = 0$
 $a=2$ $b=4$ $c=-30$

$$\frac{-4 \pm \sqrt{(4)^2 - 4(2)(-30)}}{2(2)}$$

$$\frac{-4 \pm \sqrt{16+240}}{4}$$

$$\frac{-4 \pm \sqrt{256}}{4}$$

$$\frac{-4 \pm 16}{4}$$

$$\frac{-4+16}{4} = 3$$

$$\frac{-4-16}{4} = -5$$

7. $3x^2 + 5 = -2x$
 $3x^2 + 2x + 5 = 0$

$$\frac{-2 \pm \sqrt{(2)^2 - 4(3)(5)}}{2(3)}$$

$$\frac{-2 \pm \sqrt{4-60}}{6}$$

$$\frac{-2 \pm \sqrt{-56}}{6}$$

$$\frac{-2 \pm i\sqrt{4}\sqrt{14}}{6}$$

$$\frac{-2 \pm 2i\sqrt{14}}{6} \Rightarrow \frac{-1 \pm i\sqrt{14}}{3}$$

8. $-3x = 2x^2 - 4$
 $-2x^2 - 3x + 4 = 0$
 $a=-2$ $b=-3$ $c=4$

$$\frac{-(-3) \pm \sqrt{(-3)^2 - 4(-2)(4)}}{2(-2)}$$

$$\frac{3 \pm \sqrt{9+32}}{-4}$$

$$\frac{3 \pm \sqrt{41}}{-4}$$

College Algebra – Chapter 2

Lesson 4, Day 1

$$\begin{aligned}
 9. \quad & -10x = -25 - x^2 \\
 & x^2 - 10x + 25 = 0 \\
 & \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(25)}}{2(1)} \\
 & \frac{10 \pm \sqrt{100 - 100}}{2} \\
 & \frac{10 \pm \sqrt{0}}{2} \quad \frac{10}{2} = \boxed{5}
 \end{aligned}$$

$$\begin{aligned}
 11. \quad & -4x^2 + 3x = -5 \\
 & -4x^2 + 3x + 5 = 0 \\
 & \frac{-3 \pm \sqrt{3^2 - 4(-4)(5)}}{2(-4)} \\
 & \frac{-3 \pm \sqrt{9 + 80}}{-8} \\
 & \boxed{\frac{-3 \pm \sqrt{89}}{-8}}
 \end{aligned}$$

$$\begin{aligned}
 13. \quad & -z^2 = -12z + 6 \\
 & -z^2 + 12z - 6 = 0 \\
 & \frac{-12 \pm \sqrt{12^2 - 4(-1)(-6)}}{2(-1)} \\
 & \frac{-12 \pm \sqrt{144 - 24}}{-2} \\
 & \frac{-12 \pm \sqrt{120}}{-2} \\
 & \frac{-12 \pm \sqrt{4} \sqrt{30}}{-2} \\
 & \frac{-12 \pm 2\sqrt{30}}{-2} \\
 & \boxed{6 \pm \sqrt{30}}
 \end{aligned}$$

$$\begin{aligned}
 10. \quad & -5x^2 - 6 = -4x \\
 & -5x^2 + 4x - 6 = 0 \\
 & \frac{-4 \pm \sqrt{4^2 - 4(-5)(-6)}}{2(-5)} \\
 & \frac{-4 \pm \sqrt{16 - 120}}{-10} \\
 & \frac{-4 \pm \sqrt{-104}}{-10} \\
 & \frac{-4 \pm i\sqrt{4} \sqrt{26}}{-10} \\
 & \frac{-4 \pm 2i\sqrt{26}}{-10} \\
 & \boxed{\frac{2 \pm i\sqrt{26}}{5}}
 \end{aligned}$$

$$\begin{aligned}
 12. \quad & x^2 + 121 = -22x \\
 & x^2 + 22x + 121 = 0 \\
 & \frac{-22 \pm \sqrt{22^2 - 4(1)(121)}}{2(1)} \\
 & \frac{-22 \pm \sqrt{484 - 484}}{2} \\
 & \frac{-22 \pm \sqrt{0}}{2} \Rightarrow \frac{-22}{2} = \boxed{-11}
 \end{aligned}$$

$$\begin{aligned}
 14. \quad & -7w + 6 = -4w^2 \\
 & 4w^2 - 7w + 6 = 0 \\
 & \frac{-(-7) \pm \sqrt{(-7)^2 - 4(4)(6)}}{2(4)} \\
 & \frac{7 \pm \sqrt{49 - 96}}{8} \\
 & \frac{7 \pm \sqrt{-47}}{8} \\
 & \boxed{\frac{7 \pm i\sqrt{47}}{8}}
 \end{aligned}$$

Name _____

Date _____

Decide whether the function is a polynomial function. If so, write it in standard form and state its degree, type, and leading coefficient.

1. $h(x) = 6x^3 - 9x^{-3} + x^2 - 5x - 1$
No, negative exponent

2. $f(x) = 11x^2 - \sqrt{7} + 12x$
Yes.
 $11x^2 + 12x - \sqrt{7}$
deg: 2 L.C. $\rightarrow 11$
type - Quadratic

3. $g(x) = 2x^4 - \frac{1}{14}x^2 - \sqrt{14}x^3 - \frac{5}{3}$
 $2x^4 - \sqrt{14}x^3 - \frac{1}{14}x^2 - \frac{5}{3}$
deg - 4
Type - Quartic
L.C. 2

4. $f(x) = 2x^3 + 9x^2 - 5x + \frac{4}{x} - 1$
No, variable in denominator

Evaluate the function for the given value of x.

5. $f(x) = -x^3 + 5x^2 + 9x + 4; x = -11$
 $-(-11)^3 + 5(-11)^2 + 9(-11) + 4$
 $-(-1331) + 5(121) - 99 + 4$
 $-1331 + 605 - 99 + 4$

6. $g(x) = 3x^3 + 6x^2 + 12x - 10; x = \frac{1}{3}$
 $3(\frac{1}{3})^3 + 6(\frac{1}{3})^2 + 12(\frac{1}{3}) - 10$
 $3(\frac{1}{27}) + 6(\frac{1}{9}) + 4 - 10$
 $\frac{1}{9} + \frac{2}{3} + \frac{36}{9} - \frac{90}{9}$
 $-\frac{47}{9}$

7. $h(x) = 9x^3 - 8x^2 + 11x + 8; x = -\frac{1}{2}$
 $9(-\frac{1}{2})^3 - 8(-\frac{1}{2})^2 + 11(-\frac{1}{2}) + 8$
 $9(-\frac{1}{8}) - 8(\frac{1}{4}) - \frac{11}{2} + 8$
 $-\frac{9}{8} - 2 - \frac{11}{2} + 8$
 $-\frac{9}{8} - \frac{16}{8} - \frac{44}{8} + \frac{64}{8} = \frac{-5}{8}$

8. $f(x) = 7x^4 - 10x^2 + 14x - 26; x = -7$
 $7(-7)^4 - 10(-7)^2 + 14(-7) - 26$
 $7(2401) - 10(49) - 98 - 26$
 $16807 - 490 - 98 - 26$
 16193

Describe the end behavior of the graph of the function.

9. $g(x) = -5x^4 + 7x^3 - 7x^6 + x^2 - 9x + 2$
Degree - even
L.C. \rightarrow neg
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

10. $h(x) = 7x^7 + 12x^5 - 6x^3 - 2x - 18$
deg - odd
L.C. pos.
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

11. $h(x) = -2x^3 + 5x^2 + 4x^5 - 3x^4 + 12x^2 - 4$
deg - odd
L.C. pos
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

12. $f(x) = -2x^4 + 12x^8 + 17 + 15x^2$
deg - even
L.C. pos
 $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

Name _____

Date _____

Graph the Polynomial Function.

1. $h(x) = x^4 - x^3 - 5x^2$

x	y
-2	4
-1	-3
0	0
1	-5
2	-12

deg $\rightarrow 4 \rightarrow$ even
LC $\rightarrow 1 \rightarrow$ positive
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$

3. $g(x) = x^5 - 2x^4 + x - 2$

x	y
-2	-68
-1	-6
0	-2
1	0
2	6

deg $\rightarrow 5 \rightarrow$ odd
LC $\rightarrow 1 \rightarrow$ positive
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$

5. $f(x) = 4x - 9 - x^3$

x	y
-2	-9
-1	-12
0	-9
1	-6
2	-9

deg $\rightarrow 3 \rightarrow$ odd
LC $\rightarrow -1 \rightarrow$ neg
 $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

2. $f(x) = -2x^2 - x^4 + 4$

x	y
-2	-20
-1	4
0	4
1	1
2	-20

deg $\rightarrow 4 \rightarrow$ even
LC $\rightarrow -1 \rightarrow$ neg
 $f(x) \rightarrow -\infty$ as $x \rightarrow -\infty$
 $f(x) \rightarrow -\infty$ as $x \rightarrow +\infty$

4. $f(x) = x^6 - 3x^5 + 2x^3 + x + 1$

x	y
-2	143
-1	2
0	1
1	2
2	-13

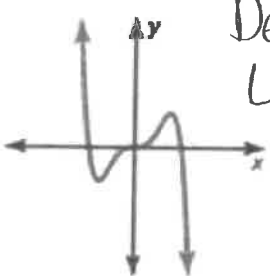
deg $\rightarrow 6 \rightarrow$ even
LC $\rightarrow 1 \rightarrow$ pos
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$

6. $g(x) = x^4 - 2x^3 + 3x$

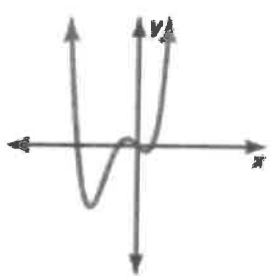
x	y
-2	26
-1	0
0	0
1	6
2	6

deg $\rightarrow 4 \rightarrow$ even
LC $\rightarrow 1 \rightarrow$ pos
 $f(x) \rightarrow +\infty$ as $x \rightarrow +\infty$
 $f(x) \rightarrow +\infty$ as $x \rightarrow -\infty$

Describe the degree and leading coefficient of the polynomial using the graph.

7. 

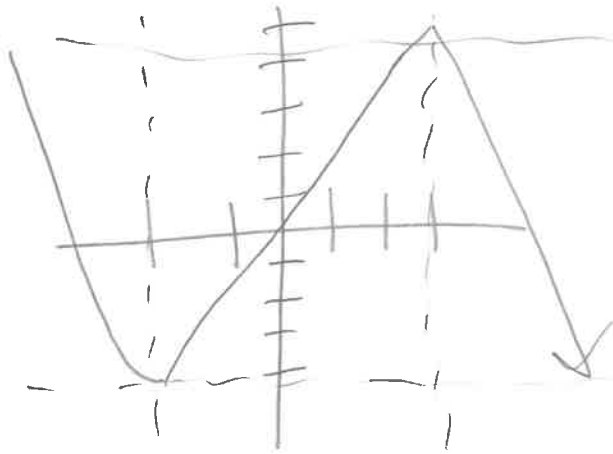
deg \rightarrow odd
LC \rightarrow Neg

8. 

deg \rightarrow even
LC \rightarrow POS

Sketch a graph of the polynomial function f having the given characteristics. Use the graph to describe the degree and leading coefficient of the function f .

- 9. --- f is increasing when $-2 < x < 3$;
 - f is decreasing when $x < -2$ and $x > 3$
 - $f(x) > 0$ when $x < -4$ and $1 < x < 5$
 - $f(x) < 0$ when $-4 < x < 1$ and $x > 5$
- deg \rightarrow odd
LC \rightarrow POS



Name _____

Date _____

Find the sum.

1. $(8x^7 - 6x^5 + 4x^3 - 6x) + (15x^6 + 4x^5 - 3x^3 + 2)$

$$8x^7 + 15x^6 - 2x^5 + x^3 - 6x + 2$$

2. $(8x^4 - 2x^3 + 9x^2 + 10x) + (6x^4 - 5x^3 - 9x^2 - 11x - 9)$

$$14x^4 - 7x^3 - x - 9$$

3. $(3x^2 + 4x - 1) + (-2x^2 - 3x + 2)$

$$x^2 + x + 1$$

4. $(7x^6 + 2x^5 - 3x^2 + 9x) + (5x^5 + 8x^3 - 6x^2 + 2x - 5)$

$$7x^6 + 7x^5 + 8x^3 - 9x^2 + 11x - 5$$

5. $(9x^4 - 3x^3 + 4x^2 + 5x + 7) + (11x^4 - 4x^2 - 11x - 9)$

$$20x^4 - 3x^3 - 6x - 2$$

Find the difference.

6. $(3x^3 - 2x^2 + 4x - 8) - (5x^3 + 12x^2 - 3x - 4)$

$$3x^3 - 2x^2 + 4x - 8 - 5x^3 - 12x^2 + 3x + 4$$

$$-2x^3 - 14x^2 + 7x - 4$$

7. $(7x^4 - 9x^3 - 4x^2 + 5x + 6) - (2x^4 + 3x^3 - 6x^2 + 2x - 5)$

$$7x^4 - 9x^3 - 4x^2 + 5x + 6 - 2x^4 - 3x^3 + 6x^2 - 2x + 5$$

$$5x^4 - 12x^3 + 2x^2 + 3x + 11$$

8. $(4x^5 - 7x^3 - 9x^2 + 18) - (14x^5 - 8x^4 + 11x^2 + x)$

$$4x^5 - 7x^3 - 9x^2 + 18 - 14x^5 + 8x^4 - 11x^2 - x$$

$$-10x^5 + 8x^4 - 7x^3 - 20x^2 - x + 18$$

9. $(8x^5 + 6x^3 - 2x^2 + 10x) - (9x^5 - x^3 - 13x^2 + 4)$

$$8x^5 + 6x^3 - 2x^2 + 10x - 9x^5 + x^3 + 13x^2 - 4$$

$$-x^5 + 7x^3 + 11x^2 + 10x - 4$$

10. $(11x^4 - 9x^2 + 3x + 11) - (2x^4 + 6x^3 + 2x - 9)$

$$11x^4 - 9x^2 + 3x + 11 - 2x^4 - 6x^3 - 2x + 9$$

$$9x^4 - 6x^3 - 9x^2 + x + 20$$

Name _____

Date _____

Find the product.

1. $7x^3(5x^2+3x+1)$

$$35x^5 + 21x^4 + 7x^3$$

2. $-4x^5(11x^3+2x^2+9x+1)$

$$-44x^8 - 8x^7 - 36x^6 - 4x^5$$

3. $(5x^2-4x+6)(-2x+3) \rightarrow (-2x+3)(5x^2-4x+6)$
 $-10x^3 + 8x^2 - 12x + 15x^2 - 12x + 18$

$$-10x^3 + 23x^2 - 24x + 18$$

4. $(-x-3)(2x^2+5x+8)$

$$-2x^3 - 5x^2 - 8x - 6x^2 - 18x - 24$$

$$-2x^3 - 11x^2 - 23x - 24$$

5. $(x^2-2x-4)(x^2-3x-5)$

$$x^4 - 3x^3 - 5x^2 - 2x^3 + 6x^2 + 10x - 4x^2 + 12x + 20$$

$$x^4 - 5x^3 - 3x^2 + 22x + 20$$

6. $(3x^2+x-2)(-4x^2-2x-1)$

$$-12x^4 - 6x^3 - 3x^2 - 4x^3 - 2x^2 - x + 8x^2 + 4x + 2$$

$$-12x^4 - 10x^3 + 3x^2 + 3x + 2$$

7. $(x-3)(x+2)(x+4)$

$$(x-3)(x^2+2x+4x+8) \rightarrow (x-3)(x^2+6x+8)$$

$$x^3 + 6x^2 + 8x - 3x^2 - 18x - 24 \rightarrow x^3 + 3x^2 - 10x - 24$$

8. $(x-5)(x+2)(x-6) \rightarrow (x-5)(x^2+2x-6x-12) \rightarrow (x-5)(x^2-4x-12)$

$$x^3 - 4x^2 - 12x - 5x^2 + 20x + 60$$

$$x^3 - 9x^2 + 8x + 60$$

9. $(3x-4)(5-2x)(4x+1) \rightarrow (3x-4)(20x-8x^2-2x+5) \rightarrow (3x-4)(-8x^2+18x+5)$

$$-24x^3 + 54x^2 + 15x + 32x^2 - 72x - 20$$

$$-24x^3 + 86x^2 - 57x - 20$$

10. $(4-5x)(1-2x)(3x+2) \rightarrow (-5x+4)(3x+2-6x^2-4x) \rightarrow (-5x+4)(-6x^2-x+2)$

$$30x^3 + 5x^2 - 10x - 24x^2 - 4x + 8$$

$$30x^3 - 19x^2 - 14x + 8$$

Name _____

Date _____

Use Pascal's Triangle to find the product.

1. $(2t + 4)^3 \rightarrow 3^{\text{rd}} \rightarrow \begin{matrix} & & 1 & & 3 & & 3 & & 1 \end{matrix}$
 $1(2t)^3(4)^0 + 3(2t)^2(4)^1 + 3(2t)(4)^2 + 1(2t)^0(4)^3$
 $8t^3 + 12(4t^2) + 6t(16) + 1(64)$
 $8t^3 + 48t^2 + 96t + 64$

2. $(6m + 3)^2 \rightarrow (6m+3)(6m+3)$
 $36m^2 + 18m + 18m + 9$
 $36m^2 + 36m + 9$

3. $(2g - 3)^4 \rightarrow 4 \rightarrow \begin{matrix} & & & & 1 & & 4 & & 6 & & 4 & & 1 \end{matrix}$
 $1(2g)^4(-3)^0 + 4(2g)^3(-3)^1 + 6(2g)^2(-3)^2 + 4(2g)^1(-3)^3 + 1(2g)^0(-3)^4$
 $16g^4 + (-12)(8g^3) + 6(4g^2)(9) + 8g(-27) + 81$
 $16g^4 - 96g^3 + 216g^2 - 216g + 81$

4. $(g + 2)^5 \rightarrow 5 \rightarrow \begin{matrix} & & & & & & 1 & & 5 & & 10 & & 10 & & 5 & & 1 \end{matrix}$
 $1(g)^5(2)^0 + 5(g)^4(2)^1 + 10(g)^3(2)^2 + 10(g)^2(2)^3 + 5(g)^1(2)^4 + 1(g)^0(2)^5$
 $g^5 + 10g^4 + 10g^3(4) + 10g^2(8) + 5g(16) + 32$
 $g^5 + 10g^4 + 40g^3 + 80g^2 + 80g + 32$

5. $(yz + 1)^5 \rightarrow 5 \rightarrow \begin{matrix} & & & & & & 1 & & 5 & & 10 & & 10 & & 5 & & 1 \end{matrix}$
 $1(yz)^5(1)^0 + 5(yz)^4(1)^1 + 10(yz)^3(1)^2 + 10(yz)^2(1)^3 + 5(yz)^1(1)^4 + 1(yz)^0(1)^5$
 $y^5z^5 + 5y^4z^4 + 10y^3z^3 + 10y^2z^2 + 5yz + 1$

Name _____

Date _____

Divide using polynomial long division.

1. $(x^2 + x - 17) \div (x - 4)$

$$\begin{array}{r} x+5 \\ x-4 \overline{) x^2 + x - 17} \\ \underline{-x^2 + 4x} \\ 5x - 17 \\ \underline{-5x + 20} \\ 3 \end{array}$$

$$\boxed{x+5 + \frac{3}{x-4}}$$

2. $(3x^2 - 14x - 5) \div (x - 5)$

$$\begin{array}{r} 3x+1 \\ x-5 \overline{) 3x^2 - 14x - 5} \\ \underline{-3x^2 + 15x} \\ x - 5 \\ \underline{-x + 5} \\ 0 \end{array}$$

$$\boxed{3x+1}$$

3. $(x^3 + x^2 + x + 2) \div (x^2 - 1)$

$$\begin{array}{r} x+1 \\ x^2+0x-1 \overline{) x^3 + x^2 + x + 2} \\ \underline{-x^3 + 0x^2 + x} \\ x^2 + 2x + 2 \\ \underline{-x^2 + 0x + 1} \\ 2x + 3 \end{array}$$

$$\boxed{x+1 + \frac{2x+3}{x^2-1}}$$

4. $(5x^4 - 2x^3 - 7x^2 - 39) \div (x^2 + 2x - 4)$

$$\begin{array}{r} 5x^2 - 12x + 37 \\ x^2 + 2x - 4 \overline{) 5x^4 - 2x^3 - 7x^2 + 0x - 39} \\ \underline{-5x^4 + 10x^3 + 20x^2} \\ 12x^3 + 13x^2 + 0x - 39 \\ \underline{-12x^3 + 24x^2 - 48x} \\ 37x^2 - 48x - 39 \\ \underline{-37x^2 + 74x + 148} \\ -122x + 109 \end{array}$$

$$\boxed{5x^2 - 12x + 37 + \frac{-122x + 109}{x^2 + 2x - 4}}$$

5. $(7x^3 + x^2 + x) \div (x^2 + 1)$

$$\begin{array}{r} 7x+1 \\ x^2+0x+1 \overline{) 7x^3 + x^2 + x + 0} \\ \underline{-7x^3 + 0x^2 + 7x} \\ x^2 - 6x + 0 \\ \underline{-x^2 + 0x + 1} \\ 6x - 1 \end{array}$$

$$\boxed{7x+1 + \frac{-6x-1}{x^2+1}}$$

6. $(4x^4 + 5x - 4) \div (x^2 - 3x - 2)$

$$\begin{array}{r} 4x^2 + 12x + 44 \\ x^2 - 3x - 2 \overline{) 4x^4 + 0x^3 + 0x^2 + 5x - 4} \\ \underline{-4x^4 + 12x^3 + 8x^2} \\ 12x^3 + 8x^2 + 5x - 4 \\ \underline{-12x^3 + 36x^2 + 24x} \\ 44x^2 + 29x - 4 \\ \underline{-44x^2 + 132x + 88} \\ 161x + 84 \end{array}$$

$$\boxed{4x^2 + 12x + 44 + \frac{161x + 84}{x^2 - 3x - 2}}$$

Name _____

Date _____

Divide using synthetic division.

1. $(x^2 + 8x + 1) \div (x - 4)$

$$\begin{array}{r|rrr} & 1 & 8 & 1 \\ 4 & \downarrow & 4 & 48 \\ \hline & 1 & 12 & 49 \end{array}$$

$$\boxed{x + 12 + \frac{49}{x-4}}$$

2. $(4x^2 - 13x - 5) \div (x - 2)$

$$\begin{array}{r|rrr} & 4 & -13 & -5 \\ 2 & \downarrow & 8 & -10 \\ \hline & 4 & -5 & -15 \end{array}$$

$$\boxed{4x - 5 + \frac{-15}{x-2}}$$

3. $(2x^2 - x + 7) \div (x + 5)$

$$\begin{array}{r|rrr} & 2 & -1 & 7 \\ -5 & \downarrow & -10 & 55 \\ \hline & 2 & -11 & 62 \end{array}$$

$$\boxed{2x - 11 + \frac{62}{x+5}}$$

4. $(x^3 - 4x + 6) \div (x + 3)$

$$\begin{array}{r|rrrr} & 1 & 0 & -4 & 6 \\ -3 & \downarrow & -3 & 9 & -15 \\ \hline & 1 & -3 & 5 & -9 \end{array}$$

$$\boxed{x^2 - 3x + 5 + \frac{-9}{x+3}}$$

5. $(x^2 + 9) \div (x - 3)$

$$\begin{array}{r|rrr} & 1 & 0 & 9 \\ 3 & \downarrow & 3 & 9 \\ \hline & 1 & 3 & 18 \end{array}$$

$$\boxed{x + 3 + \frac{18}{x-3}}$$

6. $(3x^3 - 5x^2 - 2) \div (x - 1)$

$$\begin{array}{r|rrrr} & 3 & -5 & 0 & -2 \\ 1 & \downarrow & 3 & -2 & -2 \\ \hline & 3 & -2 & -2 & -4 \end{array}$$

$$\boxed{3x^2 - 2x - 2 + \frac{-4}{x-1}}$$

7. $(x^4 - 5x^3 - 8x^2 + 13x - 12) \div (x - 6)$

$$\begin{array}{r|rrrrr} & 1 & -5 & -8 & 13 & -12 \\ 6 & \downarrow & 6 & 6 & -12 & 6 \\ \hline & 1 & 1 & -2 & 1 & -6 \end{array}$$

$$\boxed{x^3 + x^2 - 2x + 1 + \frac{-6}{x-6}}$$

8. $(x^4 + 4x^3 + 16x - 35) \div (x + 5)$

$$\begin{array}{r|rrrrr} & 1 & 4 & 0 & 16 & -35 \\ -5 & \downarrow & -5 & 5 & -25 & 45 \\ \hline & 1 & -1 & 5 & -9 & 10 \end{array}$$

$$\boxed{x^3 - x^2 + 5x - 9 + \frac{45}{x+5}}$$

Name _____

Date _____

Factor the Polynomial completely.

1. $4k^5 - 100k^3$

$$4k^3(k^2 - 25)$$

$$4k^3(k-5)(k+5)$$

2. $2m^6 - 24m^5 + 64m^4$

$$2m^4(m^2 - 12m + 32)$$

$$2m^4(m-4)(m-8)$$

3. $3r^6 - 11r^5 - 20r^4$

$$r^4(3r^2 - 11r - 20)$$

$$r^4(3r+4)(r-5)$$

4. $y^3 + 512$ $a=y$ $b=8$

$$(y+8)(y^2 - 8y + 64)$$

5. $c^3 - 27$ $a=c$ $b=3$
 $(c-3)(c^2 + 3c + 9)$

6. $9n^6 - 6561n^3$

$$9n^3(n^3 - 729) \quad \begin{matrix} a=n \\ b=9 \end{matrix}$$

$$9n^3(n-9)(n^2 + 9n + 81)$$

7. $m^3 - m^2 - 7m - 1$
 $m^2(m-1) +$

Not factorable

8. $z^3 - 5z^2 - 9z + 45$

$$z^2(z-5) - 9(z-5)$$

$$(z^2 - 9)(z-5)$$

$$(z-3)(z+3)(z-5)$$

College Algebra – Chapter 43

Lesson 4, Day 2

Factor the Polynomial Completely.

1. $4m^4 - 25$

$$(2m^2 - 5)(2m^2 + 5)$$

2. $y^4 - 3y^2 - 28$

$$(y^2 - 7)(y^2 + 4)$$

3. $81a^4 - 256$

$$(9a^2 - 16)(9a^2 + 16)$$

$$(3a - 4)(3a + 4)(9a^2 + 16)$$

4. $4n^{12} - 32n^7 + 48n^2$

$$4n^2(n^{10} - 8n^5 + 12)$$

$$4n^2(n^5 - 6)(n^5 - 2)$$

Determine whether the binomial is a factor of the polynomial.

5. $g(x) = 3x^3 - 28x^2 + 29x + 140; x + 7$

$$\begin{array}{r|rrrr} -7 & 3 & -28 & 29 & 140 \\ & \downarrow & -21 & 343 & -2604 \\ \hline & 3 & -49 & 372 & -2464 \end{array}$$

No!

6. $f(x) = 48x^4 + 36x^3 - 138x^2 - 36x + 2$

$$\begin{array}{r|rrrrr} -2 & 48 & 36 & -138 & -36 & 2 \\ & \downarrow & -96 & 120 & 36 & 0 \\ \hline & 48 & -60 & -18 & 0 & 0 \end{array}$$

Yes!

Show that the binomial is a factor of the polynomial. Then factor the function completely.

7. $f(x) = x^3 - 5x^2 - 9x + 45; x - 5$

$$\begin{array}{r|rrrr} 5 & 1 & -5 & -9 & 45 \\ & \downarrow & 5 & 0 & -45 \\ \hline & 1 & 0 & -9 & 0 \end{array}$$

$$(x^2 - 9)(x - 5)$$

$$(x - 3)(x + 3)(x - 5)$$

8. $s(x) = x^4 + 4x^3 - 64x - 256; x + 4$

$$\begin{array}{r|rrrrr} -4 & 1 & 4 & 0 & -64 & -256 \\ & \downarrow & -4 & 0 & 0 & 256 \\ \hline & 1 & 0 & 0 & -64 & 0 \end{array}$$

$a=3$
 $b=4$

$$(x^3 - 64)(x + 4)$$

$$(x - 4)(x^2 + 4x + 16)(x + 4)$$

Name _____

Date _____

Solve the equation.

1. $a^3 - 4a^2 + 4a = 0$

$$a(a^2 - 4a + 4) = 0$$

$$a(a-2)(a-2) = 0$$

$$\boxed{a=0} \quad a-2=0$$

$$\quad \quad \quad +2 \quad +2$$

$$\boxed{a=2}$$

3. $9m^5 = 27m^3$

$$-27m^3$$

$$9m^5 - 27m^3 = 0$$

$$9m^3(m^2 - 3) = 0$$

$$\frac{9m^3}{9} = 0$$

$$m^2 - 3 = 0$$

$$\quad \quad +3 \quad +3$$

$$+ \sqrt{m^2 = 3}$$

$$\boxed{m=0}$$

$$\boxed{m = \pm\sqrt{3}}$$

5. $12n^2 + 48n = -n^3 - 64$

$$+n^3 \quad +64 \quad +n^3 \quad +64$$

$$n^3 + 12n^2 + 48n + 64 = 0$$

$$n^2(n+12) + 16(3n+4) = 0$$

Cannot solve as
you cannot factor
by grouping

2. $y^3 - 2y^2 - 16y = -32$

$$+32 \quad +32$$

$$y^3 - 2y^2 - 16y + 32 = 0$$

$$y^2(y-2) - 16(y-2) = 0$$

$$(y^2 - 16)(y-2) = 0$$

$$(y-4)(y+4)(y-2) = 0$$

$$y-4=0 \quad y+4=0 \quad y-2=0$$

$$+4 \quad +4 \quad -4 \quad -4 \quad +2 \quad +2$$

$$\boxed{y=4}$$

$$\boxed{y=-4}$$

$$\boxed{y=2}$$

4. $x^4 + 40 = 14x^2$

$$-14x^2 \quad -14x^2$$

$$x^4 - 14x^2 + 40 = 0$$

$$(x^2 - 10)(x^2 - 4) = 0$$

$$x^2 - 10 = 0$$

$$x^2 - 4 = 0$$

$$+10 \quad +10$$

$$+4 \quad +4$$

$$\sqrt{x^2 = 10}$$

$$\sqrt{x^2 = 4}$$

$$\boxed{x = \pm\sqrt{10}}$$

$$\boxed{x = \pm 2}$$

6. $y^3 - 27 = 9y^2 - 27y$

$$-9y^2 \quad -9y^2 \quad +27y$$

$$+27y$$

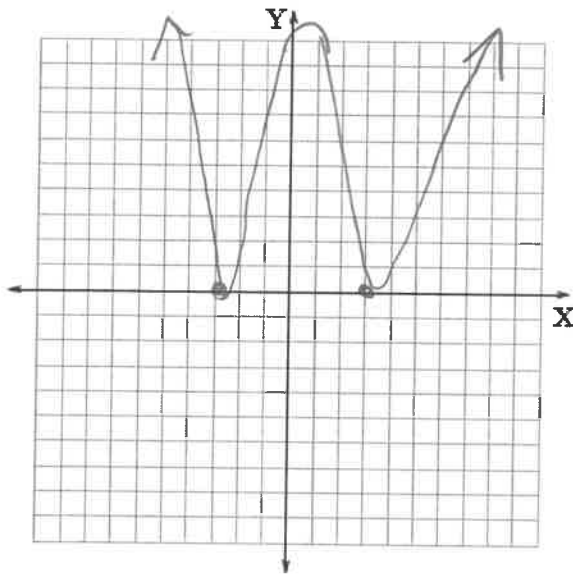
$$y^3 - 9y^2 + 27y - 27 = 0$$

$$y^2(y-9) + 27(y-1) = 0$$

Cannot solve as
you cannot factor
by grouping

Find the zeros of the function. Then sketch a graph of the function.

7. $f(x) = x^4 - 18x^2 + 81$



$$f(x) = x^4 - 18x^2 + 81$$

$$(x^2 - 9)(x^2 - 9)$$

$$(x-3)(x+3)(x-3)(x+3)$$

$$x-3=0 \quad x+3=0$$

$$\boxed{x=3} \quad \boxed{x=-3}$$

$$f(0) = (0)^4 - 18(0)^2 + 81$$

$$\Rightarrow 0 - 0 + 81$$

$$= 81$$

$$(0, 81)$$

$$f(-4) = (-4)^4 - 18(-4)^2 + 81$$

$$\Rightarrow 256 - 18(16) + 81$$

$$\Rightarrow 256 - 288 + 81$$

$$= 49$$

$$(-4, 49)$$

$$f(4) = (4)^4 - 18(4)^2 + 81$$

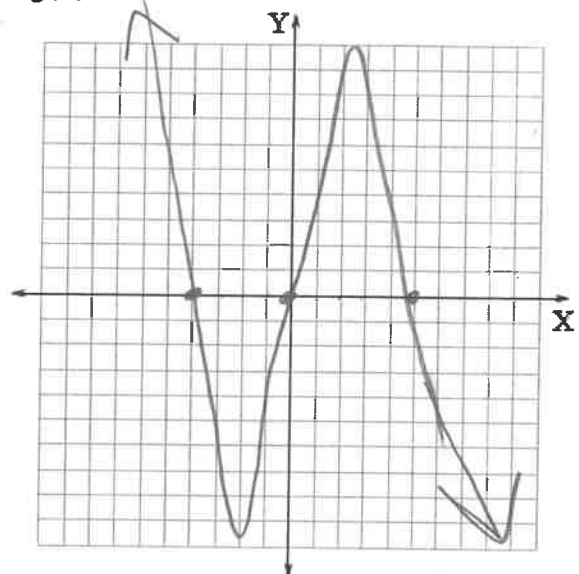
$$\Rightarrow 256 - 18(16) + 81$$

$$\Rightarrow 256 - 288 + 81$$

$$= 49$$

$$(4, 49)$$

8. $g(x) = -2x^5 + 2x^4 + 40x^3$



$$g(x) = -2x^5 + 2x^4 + 40x^3$$

$$= -2x^3(x^2 - x - 20)$$

$$= -2x^3(x-5)(x+4)$$

$$-2x^3=0$$

$$\boxed{x=0}$$

$$x-5=0$$

$$\boxed{x=5}$$

$$x+4=0$$

$$\boxed{x=-4}$$

$$g(-1) = -2(-1)^5 + 2(-1)^4 + 40(-1)^3$$

$$\Rightarrow -2(-1) + 2(1) + 40(-1)$$

$$\Rightarrow 2 + 2 - 40$$

$$= -40$$

$$\boxed{(-1, -40)}$$

$$g(1) = -2(1)^5 + 2(1)^4 + 40(1)^3$$

$$\Rightarrow -2(1) + 2(1) + 40$$

$$\Rightarrow -2 + 2 + 40$$

$$= 40$$

$$\boxed{(1, 40)}$$

$$g(-5) \Rightarrow -2(-5)^5 + 2(-5)^4 + 40(-5)^3$$

$$\Rightarrow -2(-3125) + 2(625) + 40(-125)$$

$$\Rightarrow 6250 + 1250 - 5000$$

$$\Rightarrow 1250$$

$$\boxed{(-5, 1250)}$$

$$g(6) = -2(6)^5 + 2(6)^4 + 40(6)^3$$

$$\Rightarrow -2(7776) + 2(1296) + 40(216)$$

$$\Rightarrow -15552 + 2592 + 8640$$

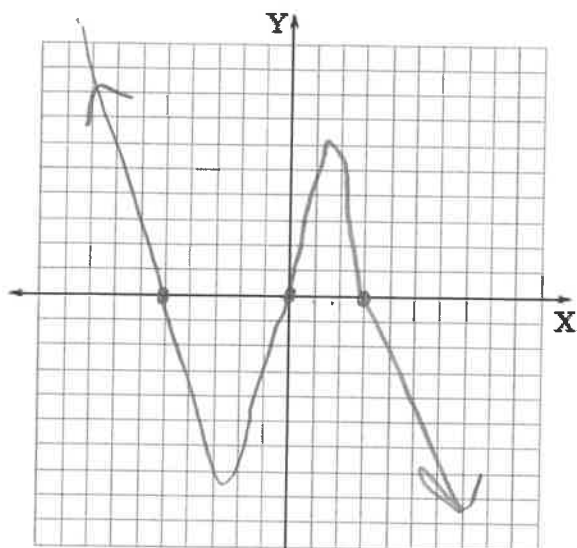
$$\Rightarrow -4320$$

$$\boxed{(6, -4320)}$$

College Algebra – Chapter 4

Lesson 1, Day 1

9. $h(x) = -x^3 - 2x^2 + 15x$



$$\begin{aligned}
 h(x) &= -x^3 - 2x^2 + 15x \\
 &= -x(x^2 + 2x - 15) \\
 &= -x(x+5)(x-3) \\
 \begin{matrix} -x=0 & x+5=0 & x-3=0 \\ \hline x=0 & x=-5 & x=3 \end{matrix}
 \end{aligned}$$

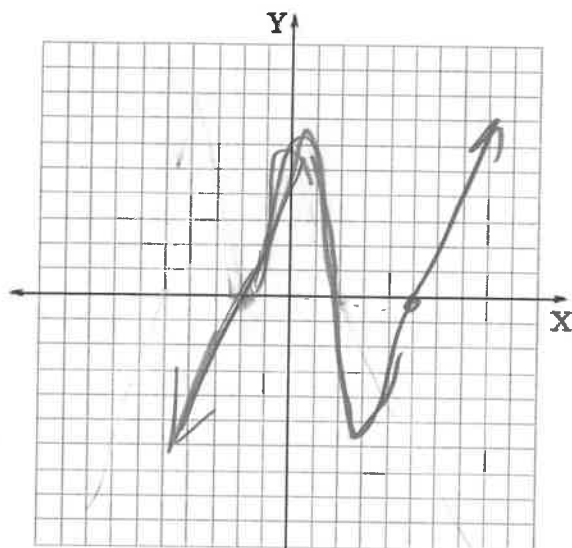
$$\begin{aligned}
 f(-6) &= -(-6)^3 - 2(-6)^2 + 15(-6) \\
 &\Rightarrow -(-216) - 2(36) - 90 \\
 &\Rightarrow 216 - 72 - 90 \\
 &= 54 \quad \boxed{(-6, 54)}
 \end{aligned}$$

$$\begin{aligned}
 f(-1) &= -(-1)^3 - 2(-1)^2 + 15(-1) \\
 &\Rightarrow -(-1) - 2(1) - 15 \\
 &\Rightarrow 1 - 2 - 15 \\
 &= -16 \quad \boxed{(-1, -16)}
 \end{aligned}$$

$$\begin{aligned}
 f(1) &= -(1)^3 - 2(1)^2 + 15(1) \\
 &\Rightarrow -1 - 2 + 15 \\
 &= 12 \quad \boxed{(1, 12)}
 \end{aligned}$$

$$\begin{aligned}
 f(4) &= -(4)^3 - 2(4)^2 + 15(4) \\
 &\Rightarrow -64 - 2(16) + 60 \\
 &\Rightarrow -64 - 32 + 60 \\
 &= -36 \quad \boxed{(4, -36)}
 \end{aligned}$$

10. $p(x) = x^3 - 5x^2 - 4x + 20$



$$\begin{aligned}
 p(x) &= x^3 - 5x^2 - 4x + 20 \\
 &\Rightarrow x^2(x-5) - 4(x-5) \\
 &\Rightarrow (x^2-4)(x-5) \\
 &= (x-2)(x+2)(x-5)
 \end{aligned}$$

$$\begin{aligned}
 p(-6) &\Rightarrow (-6)^3 - 5(-6)^2 - 4(-6) + 20 \\
 &\Rightarrow (-216) - 5(36) + 24 + 20 \\
 &\Rightarrow -216 - 180 + 24 + 20 \\
 &= -352 \quad \boxed{(-6, -352)}
 \end{aligned}$$

$$\begin{aligned}
 p(-3) &= (-3)^3 - 5(-3)^2 - 4(-3) + 20 \\
 &\Rightarrow -27 - 5(9) + 12 + 20 \\
 &\Rightarrow 27 - 45 + 12 + 20 \\
 &= 14 \quad \boxed{(-3, 14)}
 \end{aligned}$$

$$\begin{aligned}
 p(0) &= (0)^3 - 5(0)^2 - 4(0) + 20 \\
 &\Rightarrow 20 \quad \boxed{(0, 20)}
 \end{aligned}$$

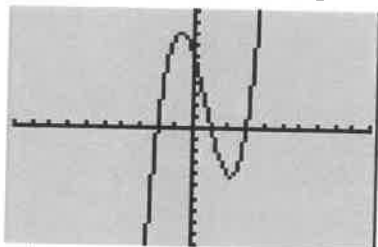
$$\begin{aligned}
 p(3) &= (3)^3 - 5(3)^2 - 4(3) + 20 \\
 &\Rightarrow 27 - 5(9) - 12 + 20 \\
 &\Rightarrow 27 - 45 - 12 + 20 \\
 &= -10 \quad \boxed{(3, -10)}
 \end{aligned}$$

Name _____

Date _____

Find all the real solutions of the equation, or the real zeros of the function given. You must list all the possible solutions as part of you answer. Show ALL of your work.

1. $x^3 - 2x^2 - 5x + 6 = 0$



$$\begin{array}{r|rrrr} & 1 & -2 & -5 & 6 \\ -2 & \downarrow & -2 & 8 & -6 \\ \hline & 1 & -4 & 3 & 0 \end{array}$$

$$(x+2)(x^2-4x+3)$$

$$(x+2)(x-3)(x-1)$$

$$x+2=0$$

$$x-3=0$$

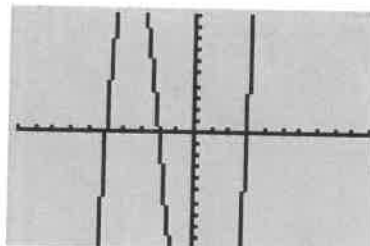
$$x-1=0$$

$$\boxed{x=-2}$$

$$\boxed{x=3}$$

$$\boxed{x=1}$$

2. $x^3 + 4x^2 - 11x - 30 = 0$



$$\begin{array}{r|rrrr} & 1 & 4 & -11 & -30 \\ 3 & \downarrow & 3 & 21 & 30 \\ \hline & 1 & 7 & 10 & 0 \end{array}$$

$$(x-3)(x^2+7x+10)$$

$$(x-3)(x+5)(x+2)$$

$$x-3=0$$

$$x+5=0$$

$$x+2=0$$

$$\boxed{x=3}$$

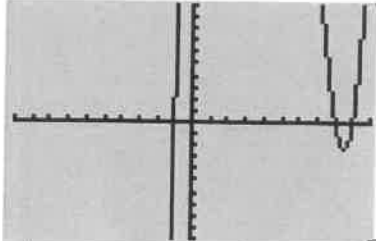
$$\boxed{x=-5}$$

$$\boxed{x=-2}$$

College Algebra – Chapter 4

Lesson 1, Day 2

3. $x^3 - 16x^2 + 55x + 72 = 0$



$$\begin{array}{r|rrrr} & 1 & -16 & 55 & 72 \\ 8 & \downarrow & 8 & -64 & -72 \\ \hline & 1 & -8 & -9 & 0 \end{array}$$

$(x+8)(x^2 - 8x - 9)$

$(x+8)(x-9)(x+1)$

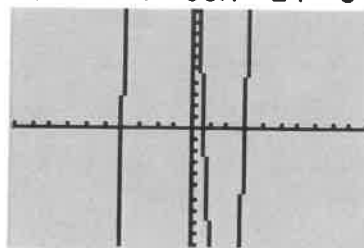
$x+8=0$ $x-9=0$ $x+1=0$

$x = -8$

$x = 9$

$x = -1$

4. $3x^3 + x^2 - 38x + 24 = 0$



$$\begin{array}{r|rrrr} & 3 & 1 & -38 & 24 \\ -4 & \downarrow & -12 & 44 & -24 \\ \hline & 3 & -11 & 6 & 0 \end{array}$$

$(x+4)(3x^2 - 11x + 6)$

$(x+4)(3x-2)(x-3)$

$x+4=0$

$3x-2=0$

$x-3=0$

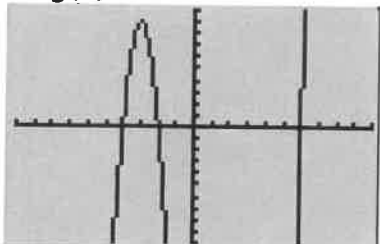
$x = -4$

$\frac{3x}{3} = \frac{2}{3}$

$x = 3$

$x = \frac{2}{3}$

5. $g(x) = x^3 - 28x - 48$



$$\begin{array}{r|rrrr} & 1 & 0 & -28 & -48 \\ -2 & \downarrow & -2 & 4 & 48 \\ \hline & 1 & -2 & -24 & 0 \end{array}$$

$(x+2)(x^2 - 2x - 24)$

$(x+2)(x-6)(x+4)$

$x+2=0$

$x-6=0$

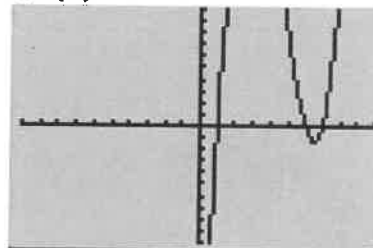
$x+4=0$

$x = -2$

$x = 6$

$x = -4$

6. $f(x) = x^3 - 14x^2 + 55x - 42$



$$\begin{array}{r|rrrr} & 1 & -14 & 55 & -42 \\ 1 & \downarrow & 1 & -13 & 42 \\ \hline & 1 & -13 & 42 & 0 \end{array}$$

$(x+1)(x^2 - 13x + 42)$

$(x+1)(x-6)(x-7)$

$x+1=0$

$x-6=0$

$x-7=0$

$x = -1$

$x = 6$

$x = 7$

Name _____

Date _____

Write a polynomial function f of least degree that has a leading coefficient of 1 and the given zeros.

1. -4, -2, 5

$$(x+4)(x+2)(x-5)$$

$$(x+4)(x^2 + 2x - 5x - 10)$$

$$(x+4)(x^2 - 3x - 10)$$

$$x^3 - 3x^2 - 10x + 4x^2 - 12x - 40$$

$$x^3 + x^2 - 22x - 40$$

2. 4, 6, $-\sqrt{7}$

$$(x-4)(x-6)\left[(x-\sqrt{7})(x+\sqrt{7})\right]$$

$$(x^2 - 4x - 6x + 24)(x^2 - 7)$$

$$(x^2 - 10x + 24)(x^2 - 7)$$

$$x^4 - 10x^3 + 24x^2 - 7x^2 + 70x - 168$$

$$x^4 - 10x^3 + 17x^2 + 70x - 168$$

3. 0, 5, $-5 + \sqrt{8}$

$$x(x-5)\left[(x-5+\sqrt{8})(x-5-\sqrt{8})\right]$$

$$x^2 - 5x\left[(x-5)(x-5) - 8\right]$$

$$(x^2 - 5x)\left[x^2 - 5x - 5x + 25 - 8\right]$$

$$(x^2 - 5x)(x^2 - 10x + 17)$$

$$x^4 - 10x^3 + 17x^2 - 5x^3 + 50x^2 - 85x$$

$$x^4 - 15x^3 + 67x^2 - 85x$$

4. -2, 3, 6

$$(x+2)(x-3)(x-6)$$

$$(x+2)(x^2 - 3x - 6x + 18)$$

$$(x+2)(x^2 - 9x + 18)$$

$$x^3 - 9x^2 + 18x + 2x^2 - 18x + 36$$

$$x^3 - 7x^2 + 36$$

5. -2, $1 + \sqrt{7}$

$$(x+2)\left[(x-1+\sqrt{7})(x-1-\sqrt{7})\right]$$

$$(x+2)\left[(x-1)(x-1) - 7\right]$$

$$(x+2)\left[x^2 - x - x + 1 - 7\right]$$

$$(x+2)(x^2 - 2x - 6)$$

$$x^3 - 2x^2 - 6x + 2x^2 - 4x - 12$$

$$x^3 - 10x - 12$$

6. -6, 0, $3 - \sqrt{5}$

$$x(x+6)\left[(x-3-\sqrt{5})(x-3+\sqrt{5})\right]$$

$$(x^2 + 6x)\left[(x-3)(x-3) - 5\right]$$

$$(x^2 + 6x)\left[x^2 - 3x - 3x + 9 - 5\right]$$

$$(x^2 + 6x)(x^2 - 6x + 4)$$

$$x^4 - 6x^3 + 4x^2 + 6x^3 - 36x^2 + 24x$$

$$x^4 - 32x^2 + 24x$$

Name _____

Date _____

Identify the number of solutions or zeros.

1. $x^4 + 2x^3 - 4x^2 + x = 0$

4 solutions

2. $5y^3 - 3y^2 + 8y = 0$

3 solutions

3. $f(z) = -7z^4 + z^2 - 25$

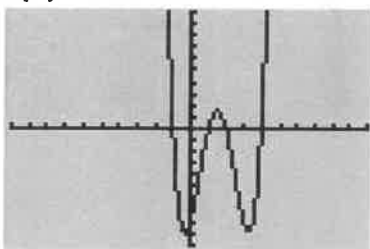
4 solutions

4. $h(x) = 5x^4 + 7x^8 - x^{12}$

12 solutions

Find all the zeros of the polynomial function.

5. $f(x) = x^4 - 6x^3 + 7x^2 + 6x - 8$



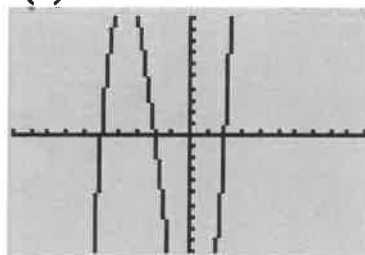
$$\begin{array}{r|rrrrr} & 1 & -6 & 7 & 6 & -8 \\ -1 & \downarrow & -1 & 7 & -14 & 8 \\ \hline & 1 & -7 & 14 & -8 & 0 \\ 2 & \downarrow & 2 & -10 & 8 & \\ \hline & 1 & -5 & 4 & 0 & \end{array}$$

$$(x+1)(x-2)(x^2-5x+4)$$

$$(x+1)(x-2)(x-4)(x-1)$$

$$\begin{array}{l} x+1=0 \\ x=-1 \end{array} \quad \begin{array}{l} x-2=0 \\ x=2 \end{array} \quad \begin{array}{l} x-4=0 \\ x=4 \end{array} \quad \begin{array}{l} x-1=0 \\ x=1 \end{array}$$

6. $h(x) = x^3 + 5x^2 - 4x - 20$



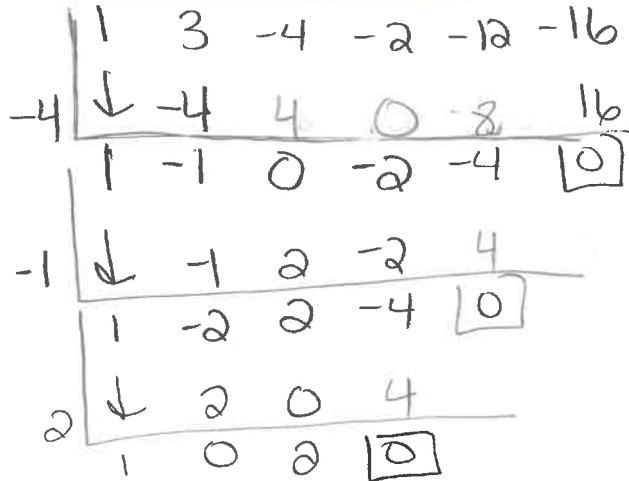
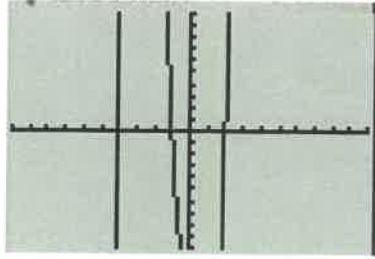
$$\begin{array}{r|rrrr} & 1 & 5 & -4 & -20 \\ -2 & \downarrow & -2 & -6 & 20 \\ \hline & 1 & 3 & -10 & 0 \end{array}$$

$$(x+2)(x^2+3x-10)$$

$$(x+2)(x+5)(x-2)$$

$$\begin{array}{l} x+2=0 \\ x=-2 \end{array} \quad \begin{array}{l} x+5=0 \\ x=-5 \end{array} \quad \begin{array}{l} x-2=0 \\ x=2 \end{array}$$

7. $g(x) = x^5 + 3x^4 - 4x^3 - 2x^2 - 12x - 16$

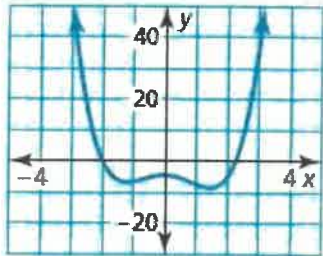


Factorization: $(x+4)(x+1)(x-2)(x^2-2)$

$x+4=0 \Rightarrow x=-4$
 $x+1=0 \Rightarrow x=-1$
 $x-2=0 \Rightarrow x=2$
 $x^2-2=0 \Rightarrow x^2=2 \Rightarrow x=\pm\sqrt{2}$

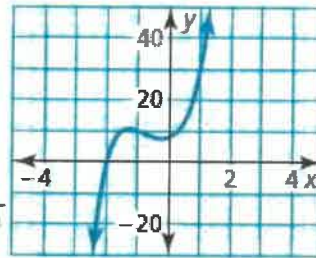
Determine the number of imaginary zeros for the function with the given degree and graph. Explain your reasoning.

8. Degree: 4



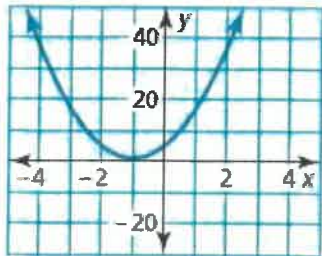
Either 0 or 2
 Crosses in two places, so 0 if 1 cross repeats 3x - 2 if they don't repeat

9. Degree: 5



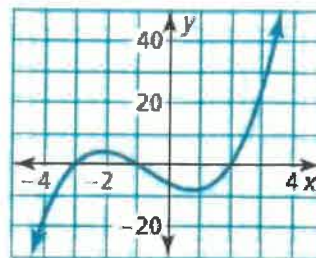
0, 4, 2
 0 if repeats 5x
 4 if repeats 1x
 2 if repeats 3x

10. Degree: 2



0 or 2
 0 if repeats 2x
 1 if repeats 1x

11. Degree: 3



0 as there are 3 intercepts

Name _____

Date _____

Write a polynomial function f of least degree that has rational coefficients, a leading coefficient of 1, and the given zeros.

1. -5, -1, 2

$$\begin{aligned} &(x+5)(x+1)(x-2) \\ &(x+5)(x^2-2x+x-2) \\ &(x+5)(x^2-x-2) \\ &x^3-x^2-2x+5x^2-5x-10 \\ &\boxed{x^3+4x^2-7x-10} \end{aligned}$$

2. 3, $(4+i)$

$$\begin{aligned} &(x-3)[(x-4+i)(x-4-i)] \\ &(x-3)[(x-4)^2-i^2] \\ &(x-3)[x^2-4x-4x+16-(-1)] \\ &(x-3)(x^2-8x+17) \\ &x^3-8x^2+17x-3x^2+24x-51 \\ &\boxed{x^3-11x^2+41x-51} \end{aligned}$$

3. 2, $(5-i)$

$$\begin{aligned} &(x-2)[(x-5-i)(x-5+i)] \\ &(x-2)[(x-5)^2-i^2] \\ &(x-2)[x^2-5x-5x+25-(-1)] \\ &(x-2)(x^2-10x+26) \\ &x^3-10x^2+26x-2x^2+20x-52 \\ &\boxed{x^3-12x^2+46x-52} \end{aligned}$$

4. $3i$, $(2-i)$

$$\begin{aligned} &[(x-3i)(x+3i)][(x-2-i)(x-2+i)] \\ &(x^2-9i^2)[(x-2)^2-i^2] \\ &[x^2-9(-1)][(x^2-2x-2x+4-(-1))] \\ &(x^2+9)(x^2-4x+5) \\ &x^4-4x^3+5x^2+9x^2-36x+45 \\ &\boxed{x^4-4x^3+14x^2-36x+45} \end{aligned}$$

College Algebra - Chapter 4
Lesson 2, Day 2

Determine the possible numbers of positive real zeros, negative real zeros, and imaginary zeros for the function.

5. $f(x) = x^4 - x^2 - 6$
 $\underbrace{\quad}_Y \quad \underbrace{\quad}_N$

Positive: 1
 Negative: $(-x)^4 - (-x)^2 - 6$
 $x^4 - x^2 - 6$
 $\underbrace{\quad}_Y \quad \underbrace{\quad}_N$

Neg: 1

Pos	Neg	Imag	Total
1	1	2	4

6. $g(x) = -x^3 + 5x^2 + 12$
 $\underbrace{\quad}_Y \quad \underbrace{\quad}_N$

Positive: 1
 Negative: $-(-x)^3 + 5(-x)^2 + 12$
 $-(-x) + 5(x) + 12$
 $x + 5x + 12$
 $\underbrace{\quad}_N \quad \underbrace{\quad}_N$

Neg: 0

Pos	Neg	Imag	Total
1	0	2	3

7. $g(x) = x^5 + 7x^4 - 4x^3 - 3x^2 + 9x - 15$
 $\underbrace{\quad}_N \quad \underbrace{\quad}_Y \quad \underbrace{\quad}_N \quad \underbrace{\quad}_Y \quad \underbrace{\quad}_Y$

Pos: 3 OR 1

Neg: $(-x)^5 + 7(-x)^4 - 4(-x)^3 - 3(-x)^2 + 9(-x) - 15$
 $-x^5 + 7x^4 + 4(-x^3) - 3(x^2) - 9x - 15$
 $-x^5 + 7x^4 + 12x^3 - 3x^2 - 9x - 15$
 $\underbrace{\quad}_Y \quad \underbrace{\quad}_N \quad \underbrace{\quad}_Y \quad \underbrace{\quad}_N \quad \underbrace{\quad}_N$

Neg: 2 OR 0

Pos	Neg	Imag	Total
3	2	0	5
3	0	2	5
1	2	2	5
1	0	5	6

8. $g(x) = x^7 + 4x^4 - 10x + 25$
 $\underbrace{\quad}_N \quad \underbrace{\quad}_Y \quad \underbrace{\quad}_Y$

Pos: 2 OR 0

Neg: $(-x)^7 + 4(-x)^4 - 10(-x) + 25$
 $-x^7 + 4(x^4) + 10x + 25$
 $-x^7 + 4x^4 + 10x + 25$
 $\underbrace{\quad}_Y \quad \underbrace{\quad}_N \quad \underbrace{\quad}_N$

Neg: 1

Pos	Neg	Imag	Total
2	1	4	7
0	1	6	7

College Algebra – Chapter 4
Lesson 3

Name _____

Date _____

Match the function with its graph.

1. $f(x) = (x - 1)(x - 2)(x + 2)$

A

2. $H(x) = (x + 2)^2(x + 1)$

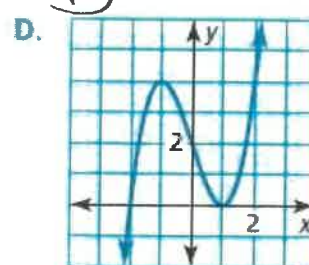
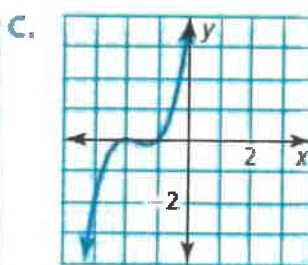
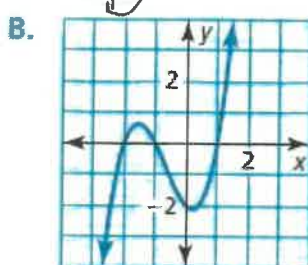
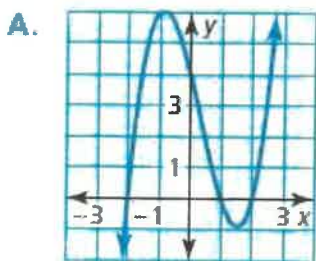
C

3. $g(x) = (x + 1)(x - 1)(x + 2)$

B

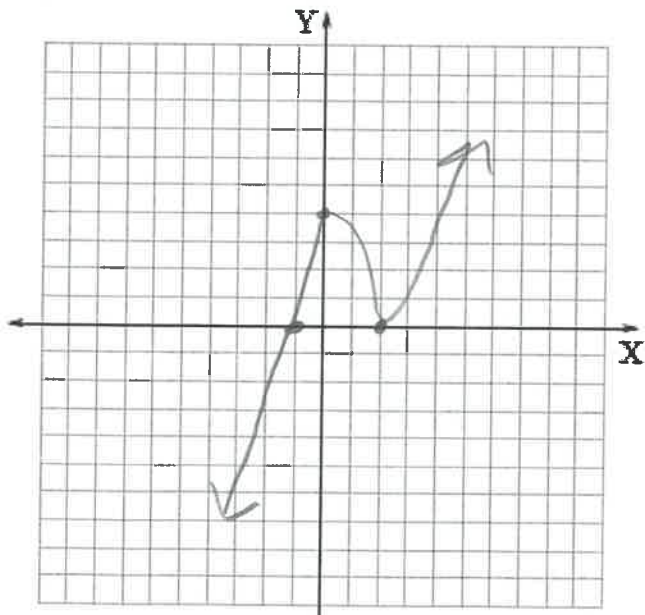
4. $F(x) = (x - 1)^2(x + 2)$

D



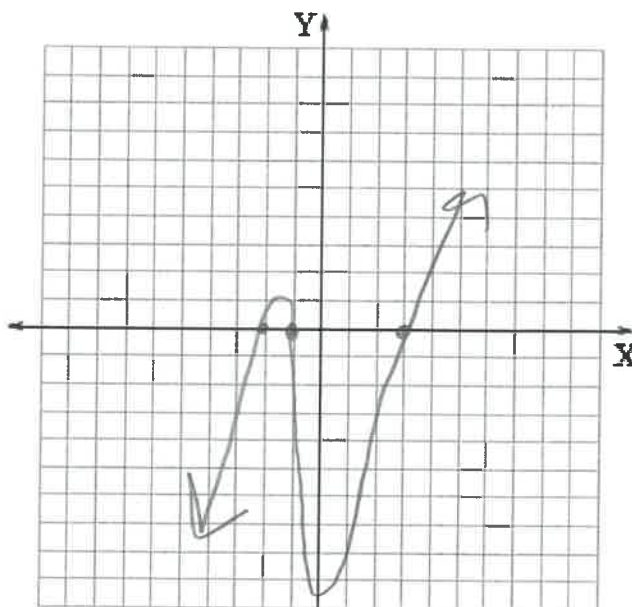
Graph the function.

5. $f(x) = (x - 2)^2(x + 1)$



$$\begin{aligned} f(0) &= (0-2)^2(0+1) \\ &\Rightarrow (-2)^2(1) \\ &= (4)(1) \\ &= 4 \quad (0, 4) \end{aligned}$$

6. $G(x) = 4(x + 1)(x + 2)(x - 3)$



$$\begin{aligned} f(0) &= 4(0+1)(0+2)(0-3) \\ &\Rightarrow 4(1)(2)(-3) \\ &\Rightarrow -24 \quad (0, -24) \end{aligned}$$

College Algebra – Chapter 4

Lesson 3

Find all real zeros of the function.

7. $f(x) = x^3 - 4x^2 - x + 4$

$$\begin{array}{r|rrrr} & 1 & -4 & -1 & 4 \\ -1 & \downarrow & & & \\ & 1 & -5 & 4 & 0 \end{array}$$

$(x+1)(x^2-5x+4)$
 $(x+1)(x-4)(x-1)$
 $x+1=0$ $x-4=0$ $x-1=0$
 $x=-1$ $x=4$ $x=1$

8. $H(x) = 4x^3 + 2x^2 - 24x - 18$

$$\begin{array}{r|rrrr} & 4 & 2 & -24 & -18 \\ -\frac{3}{2} & \downarrow & & & \\ & 4 & -4 & -12 & 0 \end{array}$$

$(x+\frac{3}{2})(4x^2-4x-12)$
 $(x+\frac{3}{2})4(x^2-x-3)$
 $4(x+\frac{3}{2})(x^2-x-3)$
 $x+\frac{3}{2}=0$
 $x=-\frac{3}{2}$

$$\frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-3)}}{2(1)}$$

$$\frac{1 \pm \sqrt{1+12}}{2}$$

$$\frac{1 \pm \sqrt{13}}{2}$$

9. $g(x) = 4x^3 + x^2 - 51x + 36$

$$\begin{array}{r|rrrr} & 4 & 1 & -51 & 36 \\ 3 & \downarrow & & & \\ & 4 & 13 & -12 & 0 \end{array}$$

$(x-3)(4x^2+13x-12)$
 $(x-3)(4x-3)(x+4)$
 $x-3=0$ $4x-3=0$ $x+4=0$
 $x=3$ $4x=3$ $x=-4$
 $x=\frac{3}{4}$

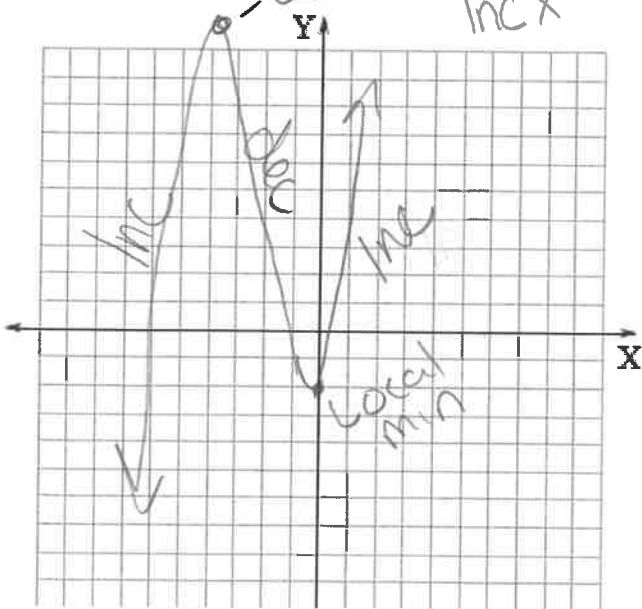
10. $F(x) = 2x^3 - 3x^2 - 32x - 15$

$$\begin{array}{r|rrrr} & 2 & -3 & -32 & -15 \\ 5 & \downarrow & & & \\ & 2 & 7 & 3 & 0 \end{array}$$

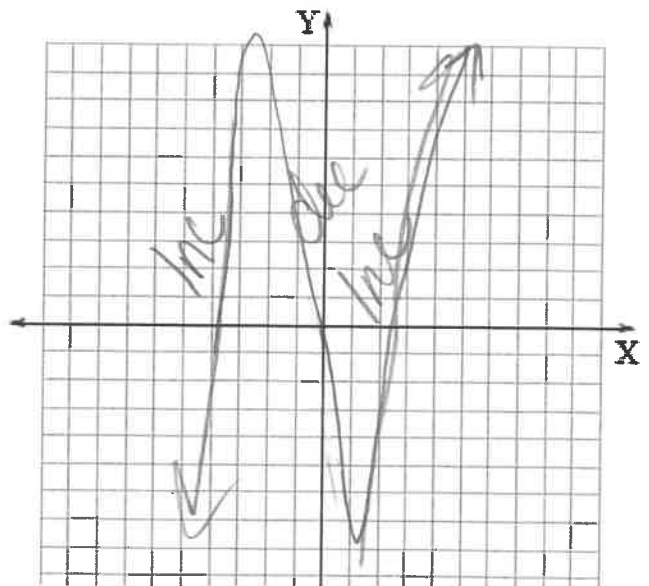
$(x-5)(2x^2+7x+3)$
 $(x-5)(2x+1)(x+3)$
 $x-5=0$ $2x+1=0$ $x+3=0$
 $x=5$ $2x=-1$ $x=-3$
 $x=-\frac{1}{2}$

Graph the function. Identify the x-intercepts and the points where the local maximums and local minimums occur. Determine the intervals for which the function is increasing and decreasing.

11. $G(x) = 2x^3 + 8x^2 - 3x - 4$



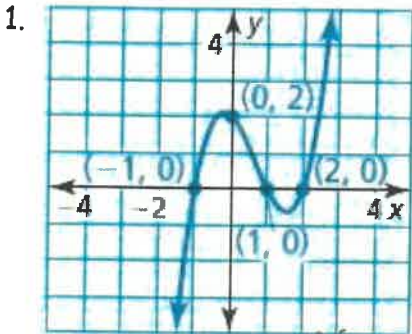
12. $H(x) = x^5 + 2x^2 - 17x - 4$



Name _____

Date _____

Write a cubic function whose graph passes through the given points.



$$f(x) = a(x+1)(x-1)(x-2)$$

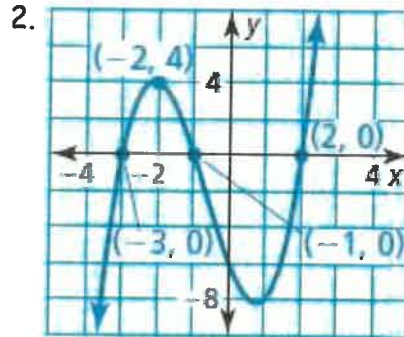
$$2 = a(0+1)(0-1)(0-2)$$

$$2 = a(1)(-1)(-2)$$

$$\frac{2}{2} = \frac{2a}{2}$$

$$1 = a$$

$$f(x) = (x+1)(x-1)(x-2)$$



$$f(x) = a(x+3)(x+1)(x-2)$$

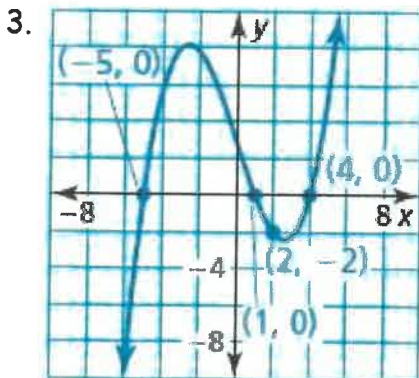
$$4 = a(-2+3)(-2+1)(-2-2)$$

$$4 = a(1)(-1)(-4)$$

$$\frac{4}{4} = \frac{4a}{4}$$

$$1 = a$$

$$f(x) = (x+3)(x+1)(x-2)$$



$$f(x) = a(x+5)(x-1)(x-4)$$

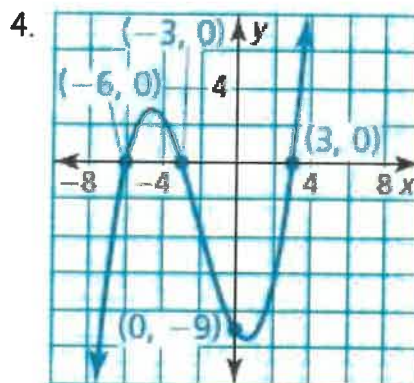
$$-2 = a(2+5)(2-1)(2-4)$$

$$-2 = a(7)(1)(-2)$$

$$\frac{-2}{-14} = \frac{-14a}{-14}$$

$$\frac{1}{7} = a$$

$$f(x) = \frac{1}{7}(x+5)(x-1)(x-4)$$



$$f(x) = a(x+6)(x+3)(x-3)$$

$$-9 = a(0+6)(0+3)(0-3)$$

$$-9 = a(6)(3)(-3)$$

$$\frac{-9}{-54} = \frac{-54a}{-54}$$

$$\frac{1}{6} = a$$

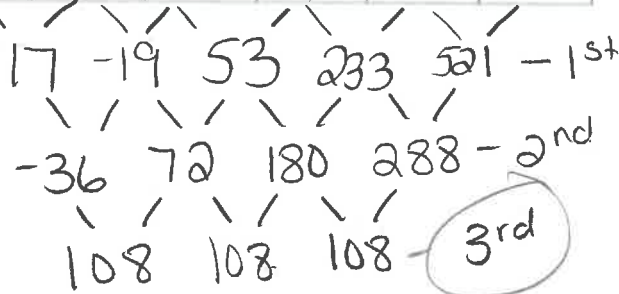
$$f(x) = \frac{1}{6}(x+6)(x+3)(x-3)$$

College Algebra – Chapter 4
Lesson 4

Use finite differences to determine the degree of the polynomial function that fits the data.

5.

x	-6	-3	0	3	6	9
$f(x)$	-2	15	-4	49	282	803



6. $(-4, -317), (-3, -37), (-2, 21), (-1, 7), (0, -1), (1, 3), (2, -47), (3, -289), (4, -933)$

