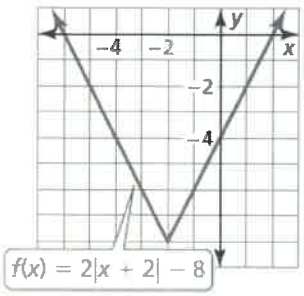
College Algebra – Chapter 8
Lesson 1, Day 1
Name _____

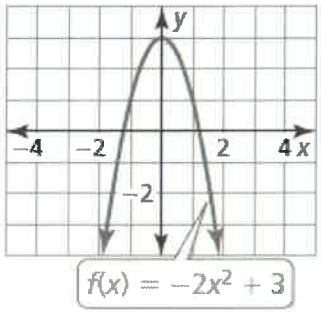
Identify the function family to which f belongs. Compare the graph of f to the graph of its parent function.

1.



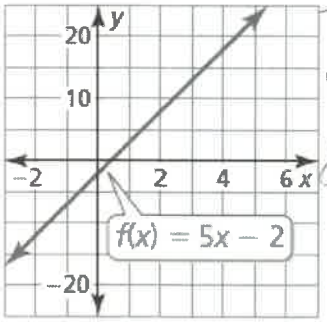
Abs Value
8 units down
2 units left
Vert Stretch by 2

2.



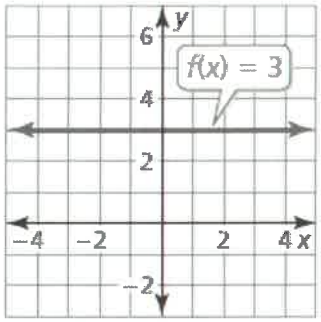
Quadratic
Reflect x-axis
Trans 3 up
Vert. Stretch by 2

3.



Trans 2 down
Vert. Stretch by 5
Linear

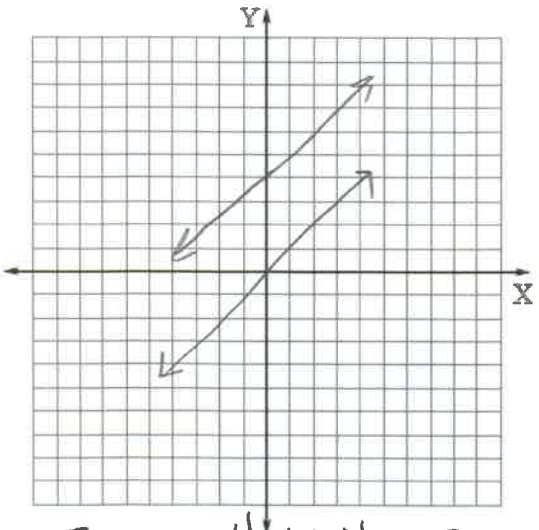
4.



Constant
Trans 2 up

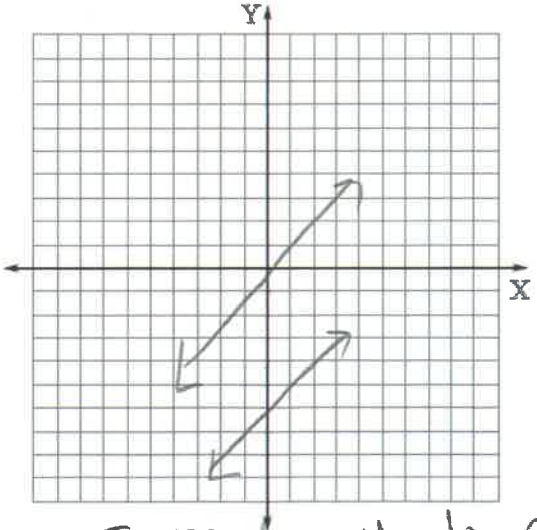
Graph the function and its parent function. Then describe the transformation.

5. g(x) = x + 4



Trans 4 units up

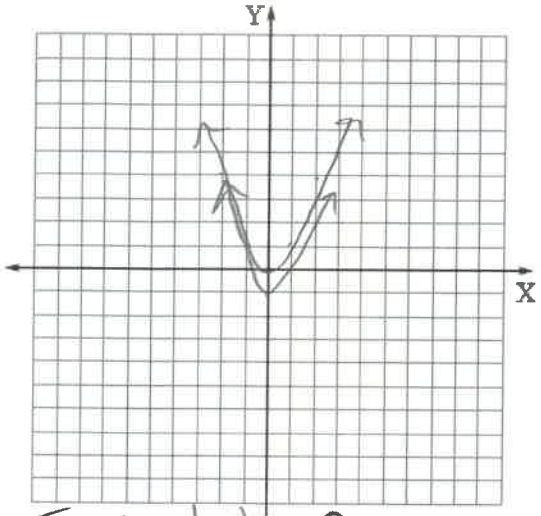
6. F(x) = x − 6



Trans 6 units down

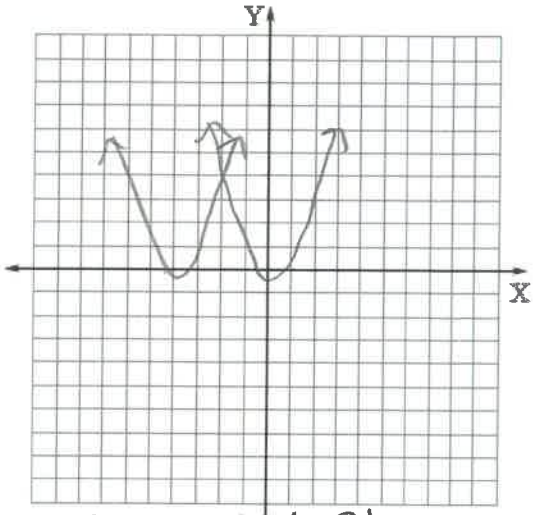
College Algebra – Chapter 8
Lesson 1, Day 1

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



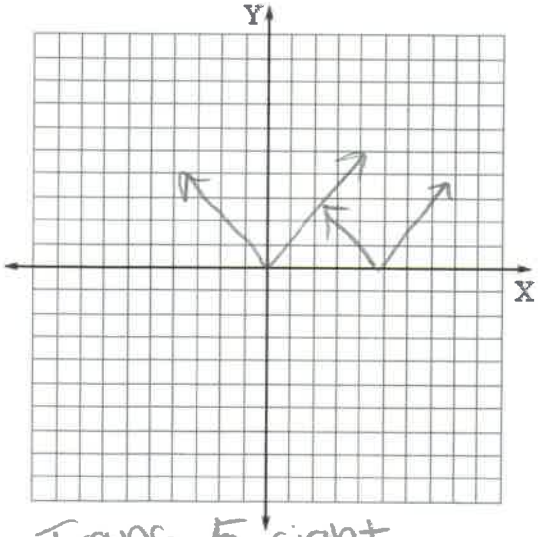
Trans 1 down

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



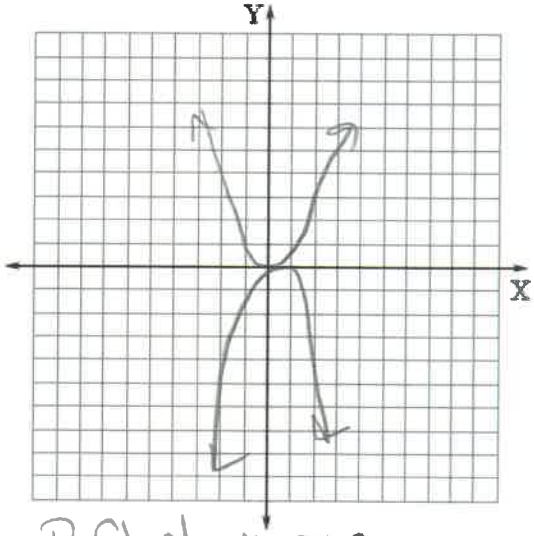
Trans 4 left

9. $g(x) = |x - 5|$



Trans 5 right

10. $H(x) = -x^2$

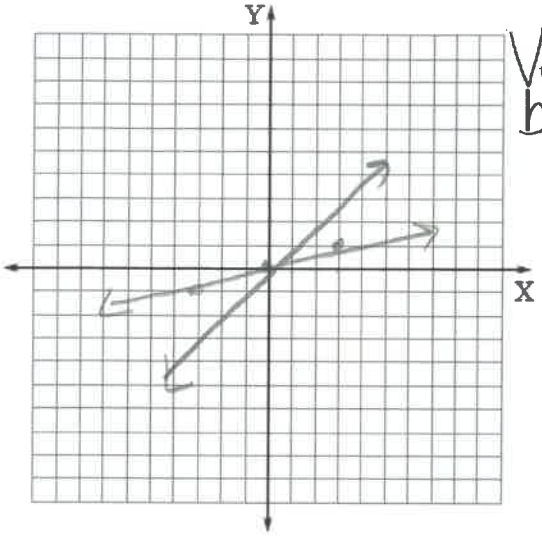


Reflect x-axis

College Algebra – Chapter 8
Lesson 1, Day 2
Name _____

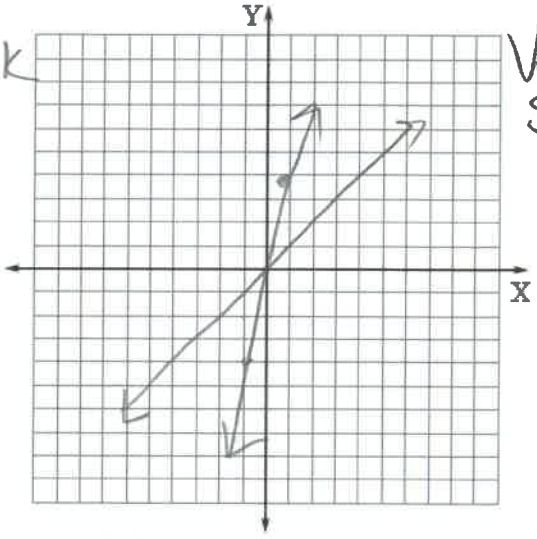
Graph the function and its parent function. Then describe the transformation.

1. $f(x) = 1/3x$



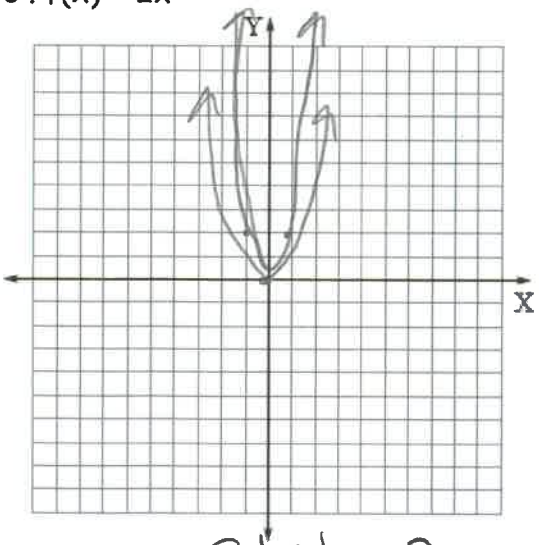
Vert Shrink by $\frac{1}{3}$

2. $g(x) = 4x$



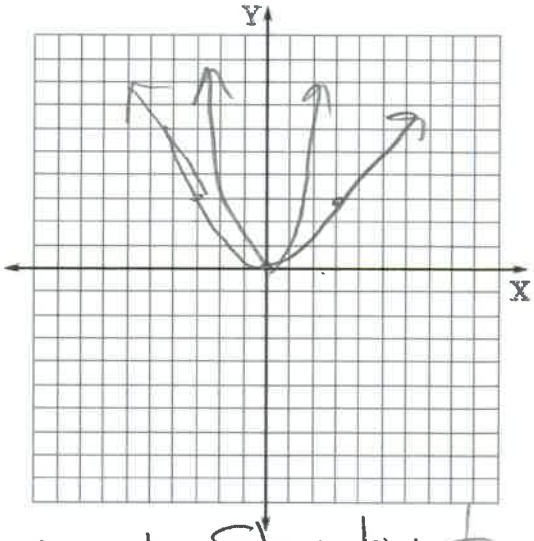
Vert. Str by 4

3. $f(x) = 2x^2$



Vert Str by 2

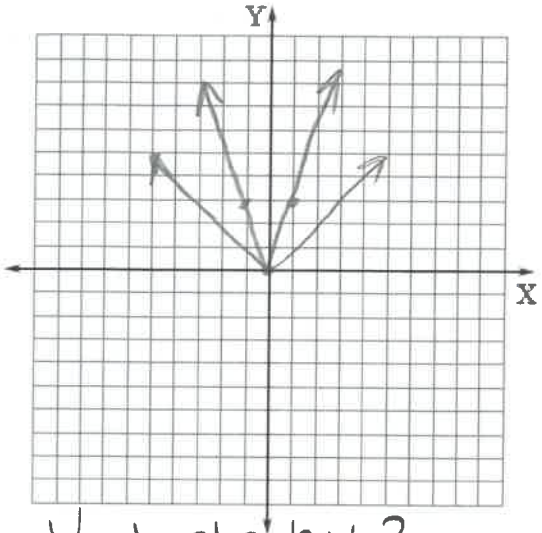
4. $g(x) = 1/3x^2$



Vert. Shr by $\frac{1}{3}$

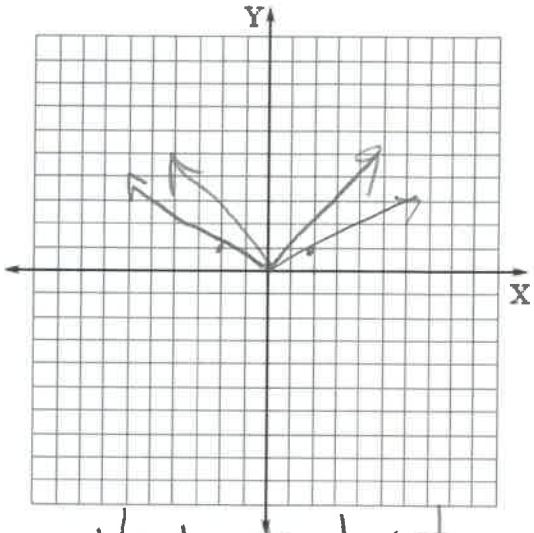
College Algebra – Chapter 8
Lesson 1, Day 2

5. $g(x) = 3|x|$



Vert str by 3

6. $F(x) = \frac{1}{2}|x|$



Vert shr by $\frac{1}{2}$

Describe the transformation when transformed from its parent function.

7. $f(x) = 3x + 2$

Trans 2 up
Vert str by 3

8. $H(x) = -x + 5$

Trans 5 up
reflect x-axis

9. $h(x) = -3|x| - 1$

trans 1 down
Vert Str by 3
Reflect x-axis

10. $\frac{3}{4}|x| + 1$

Trans 1 up
Vert Shrink by $\frac{3}{4}$

11. $g(x) = \frac{1}{2}x^2 - 6$

Trans 6 down
Vert Shrink by $\frac{1}{2}$

12. $4x^2 - 3$

Trans 3 down
Vert Str by 4

13. $f(x) = -(x + 3)^2 + \frac{1}{4}$

Trans $\frac{1}{4}$ up
Trans 3 left
Reflect x-axis

College Algebra – Chapter 8
Lesson 2, Day 1
Name _____

Write a function g whose graph represents the indicated transformation of the graph of f. If possible, use a graphing calculator to check your answer.

1. f(x) = x - 5; translation 4 units to the left.

$(x+4)-5$

2. f(x) = x + 2; translation 2 units to the right.

$(x-2)+2$

3. f(x) = |4x + 3| + 2; translation 2 units down.

$(|4x+3|+2)-2$

4. f(x) = 2x - 9; translation 6 units up.

$(2x-9)+6$

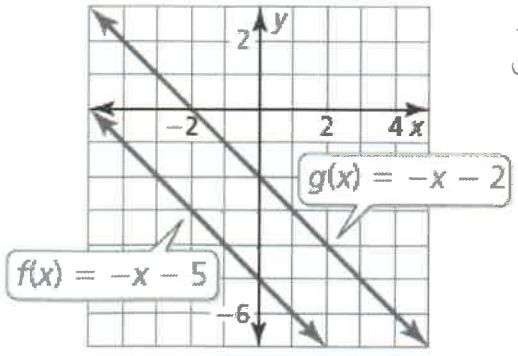
5. f(x) = 4 - |x + 1|; translation 3 units right.

$4-|(x-3)+1|$

6. f(x) = |4x| + 5; translation 1 unit up.

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

7. Describe two translations of the graph of f that results in the graph of g.



3 units up
OR
3 units right

College Algebra – Chapter 8
Lesson 2, Day 1

Write a function g whose graph represents the indicated transformation of the graph of f. If possible, use a graphing calculator to check your answer.

8. $F(x) = -5x + 2$; reflection in the x-axis.

$-(-5x+2)$

9. $f(x) = \frac{1}{2}x - 3$; reflection in the x-axis.

$-\left(\frac{1}{2}x-3\right)$

10. $f(x) = |6x| - 2$; reflection in the y-axis.

$|6(-x)|-2$

11. $f(x) = |2x - 1| + 3$; reflection in the y-axis.

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

12. $f(x) = -3 + |x - 11|$; reflection in the y-axis.

$-3+|(-x)-11|$

13. $f(x) = -x + 1$: reflection in the y-axis.

$-(-x)+1$

College Algebra – Chapter 8
Lesson 2, Day 2
Name _____

Write a function g whose graph represents the indicated transformation of the graph of f. If possible, use a graphing calculator to check your answer.

1. f(x) = x + 2; vertical stretch by a factor of 5.

$5(x+2)$

2. f(x) = 2x + 6; vertical shrink by a factor of $\frac{1}{2}$.

$2(\frac{1}{2}x)+6$

3. f(x) = |2x| + 4; horizontal shrink by a factor of $\frac{1}{2}$.

$|2(2x)|+4$

4. f(x) = |x + 3|; horizontal stretch by a factor of 4.

$\frac{1}{4}|x+3|$

5. f(x) = x; vertical stretch by a factor of 2 followed by a translation 1 unit up.

$2(x)$

$(2(x))+1$

College Algebra – Chapter 8
Lesson 2, Day 2

6. f(x) = x; translation 3 units down followed by a vertical shrink by a factor of 1/3.

$x-3$

$\frac{1}{3}(x-3)$

7. f(x) = |x|; translation 2 units to the right followed by a horizontal stretch by a factor of 2.

$|(x-2)|$

$|(\frac{1}{2}x-2)|$

8. f(x) = |x|; reflection in the y-axis followed by a translation 3 units to the right.

$|(-x)|$

$|((-x)+3)|$

Identify and correct the error in writing the function g whose graph represents the indicated transformations of the graph of f.

9. ✗ f(x) = |x|; translation 3 units to the right followed by a translation 2 units up

$g(x) = |x+3| + 2$

Should be −

$|(x-3)|+2$

10. ✗ f(x) = x; translation 6 units down followed by a vertical stretch by a factor of 5

$g(x) = 5x - 6$

need to put in parantheses

$5(x-6)$

College Algebra – Chapter 8
Lesson 3
Name _____

Describe the transformation of $f(x) = x^2$ represented by g. Then graph each function (graph paper attached to worksheet).

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

Trans 3 units down

2. $G(x) = x^2 + 1$

trans 1 unit up

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

trans 2 units left

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

4 units right

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

1 unit right

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

3 units left

7. $g(x) = (x + 6)^2 - 2$

6 units left
2 units down

8. $G(x) = (x - 9)^2 + 5$

9 units right
5 units up

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

7 units right
1 unit up

10. $G(x) = (x + 10)^2 - 3$

10 units left
3 units down

11. $g(x) = -x^2$

reflect x-axis

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

reflect y-axis

College Algebra – Chapter 8
Lesson 3

13. $g(x) = 3x^2$

Vert str by 3

14. $G(x) = \frac{1}{3}x^2$

Vert shrink by $\frac{1}{3}$

15. $g(x) = (2x)^2$

Horizontal shrink by $\frac{1}{2}$

16. $G(x) = -(2x)^2$

Hori shrink by $\frac{1}{2}$
Reflect x-axis

17. $g(x) = \frac{1}{5}x^2 - 4$

Vert shrink by $\frac{1}{5}$
trans 4 units down

18. $G(x) = \frac{1}{2}(x - 1)^2$

Vert shrink by $\frac{1}{2}$
trans 1 unit right

Describe and correct the error in analyzing the graph of $f(x) = -6x^2 + 4$.

19.

X The graph is a reflection in the y-axis and a vertical stretch by a factor of 6, followed by a translation 4 units up of the graph of the parent quadratic function.

x-axis

$y = x^2$
$y = (-x)^2$
$\Rightarrow x^2$
$= 6x^2 + 4$

20.

X The graph is a translation 4 units down, followed by a vertical stretch by a factor of 6 and a reflection in the x-axis of the graph of the parent quadratic function.

$y = x^2$
$= x^2 - 4$
$= 6(x^2 - 4)$
$= 6x^2 - 24$

need to do vert stretch before translation

College Algebra – Chapter 8
Lesson 3

Write a rule for g described by the transformations of the graph of f. Then identify the vertex.

21. $F(x) = x^2$; vertical stretch by a factor of 4 and a reflection in the x-axis, followed by a translation 2 units up.

$4x^2 \Rightarrow -(4x^2) \Rightarrow (-(4x^2))+2$

22. $f(x) = x^2$; vertical shrink by a factor of 1/3 and a reflection in the y-axis, followed by a translation 3 units right.

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

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

23. $f(x) = 8x^2 - 6$; horizontal stretch by a factor of 2 and a translation 2 units up, followed by a reflection in the y-axis.

$(8(\frac{1}{2}x)^2-6)+2$

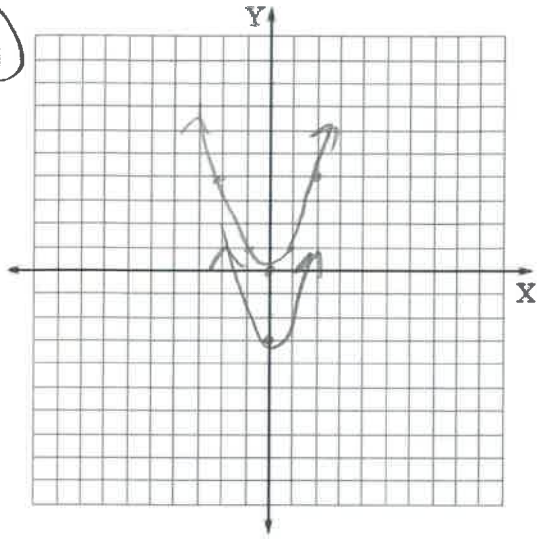
$(8(\frac{1}{2}(-x))^2-6)+2$

24. $f(x) = (x + 6)^2 + 3$; horizontal shrink by a factor of $\frac{1}{2}$ and a translation 1 unit down, followed by a reflection in the x-axis.

$-(((((2x)+6)^2+3)-1))$

College Algebra – Chapter 8
Lesson 3

1



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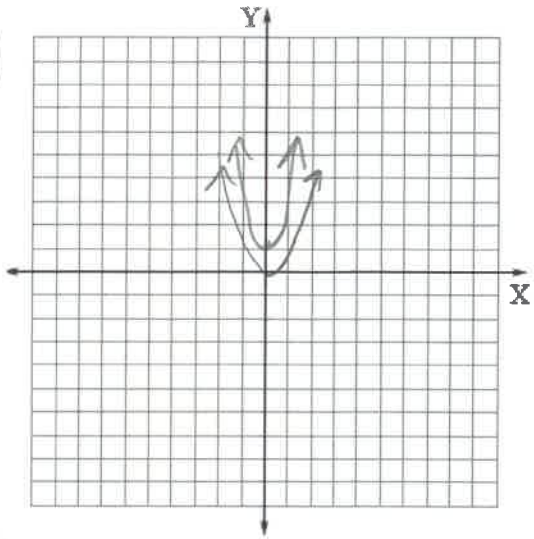

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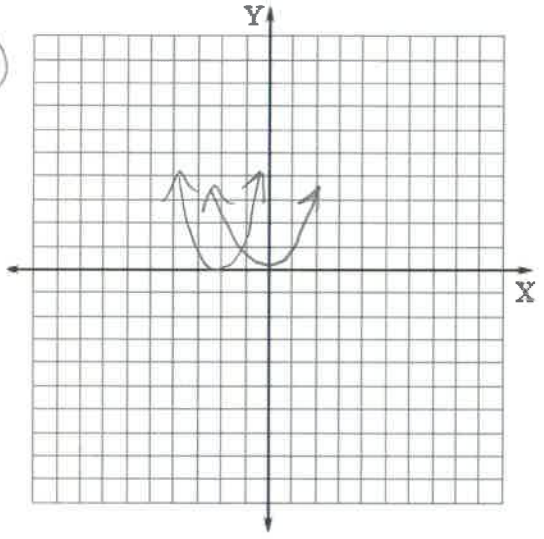

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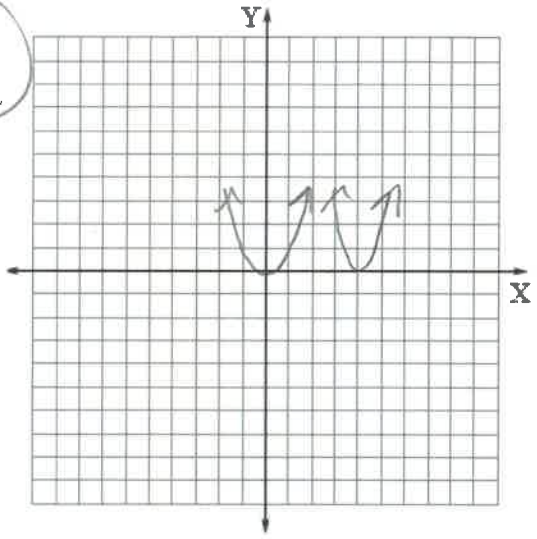

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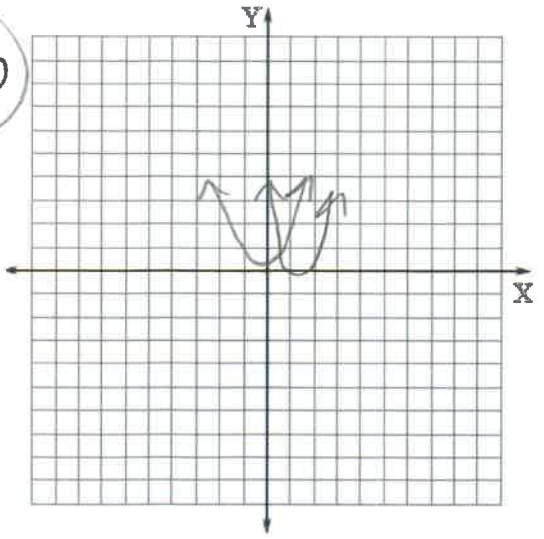

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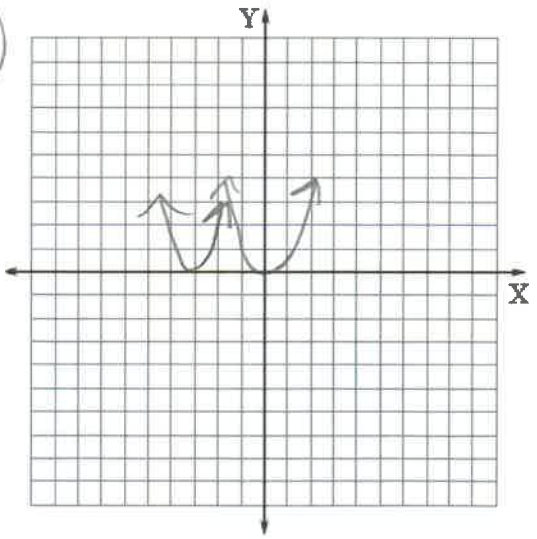
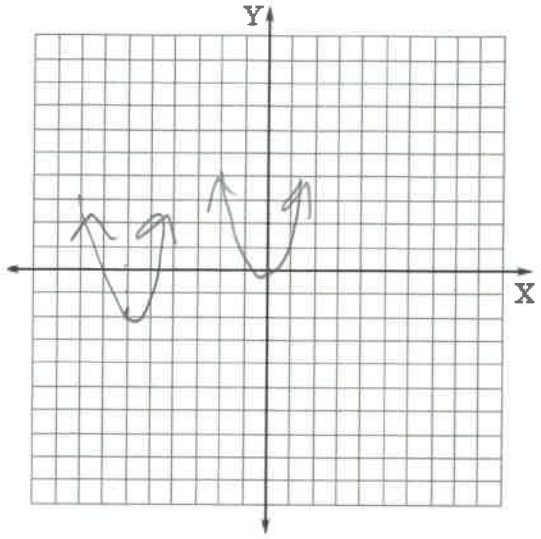


College Algebra – Chapter 8
Lesson 3

7



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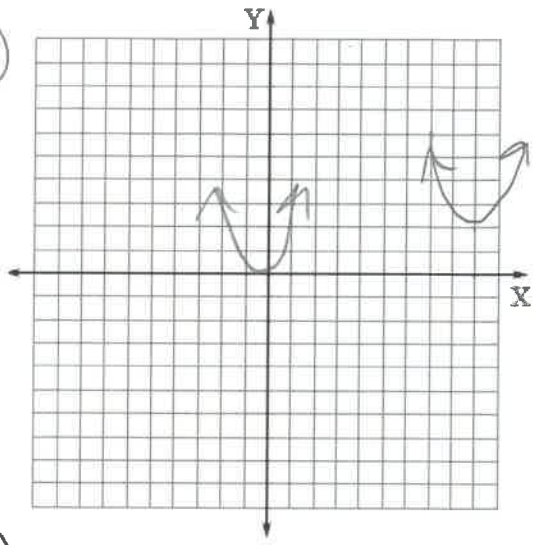

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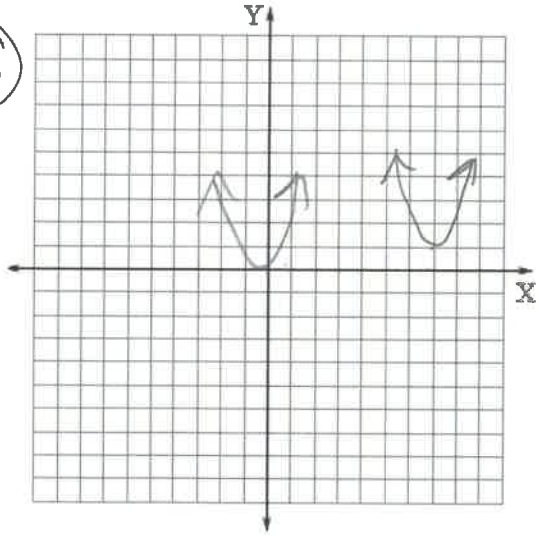

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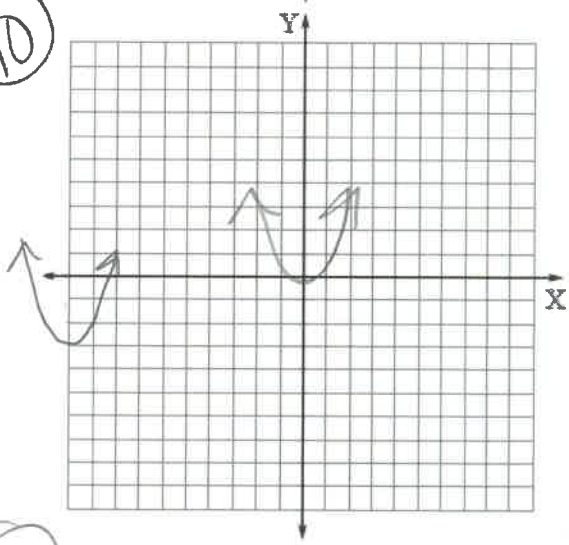

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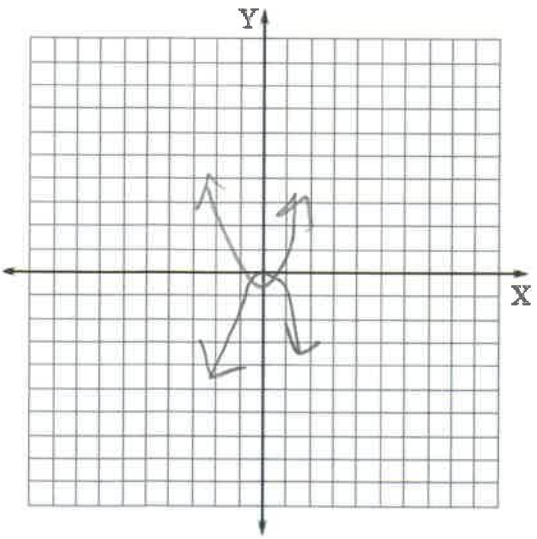

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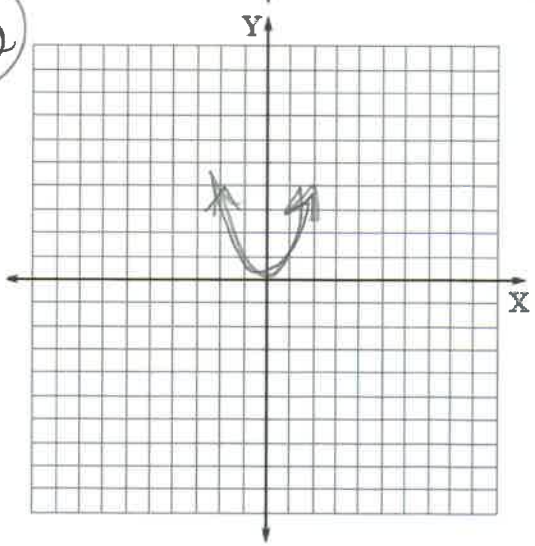
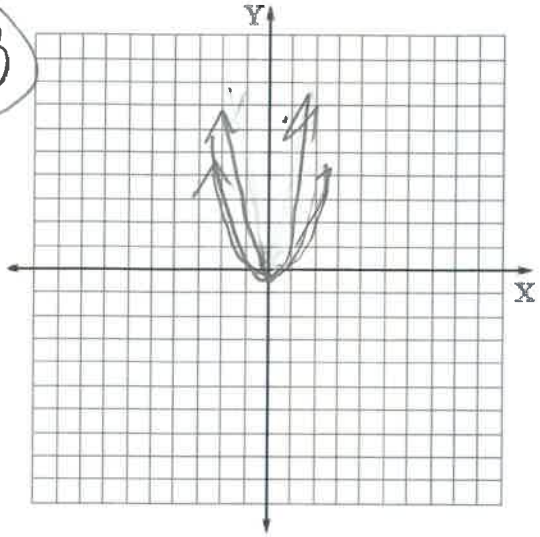


College Algebra – Chapter 8
Lesson 3

13



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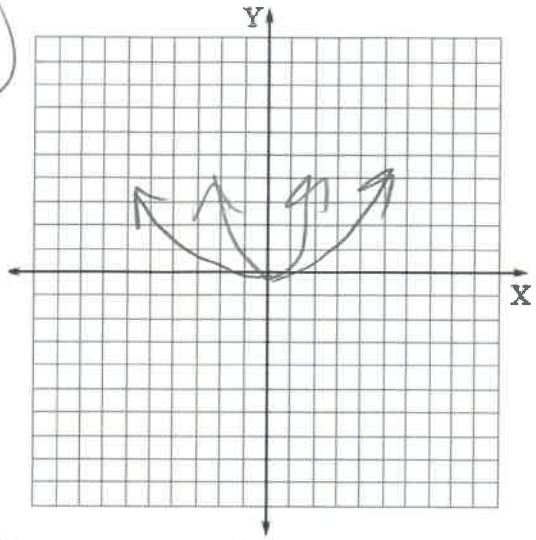

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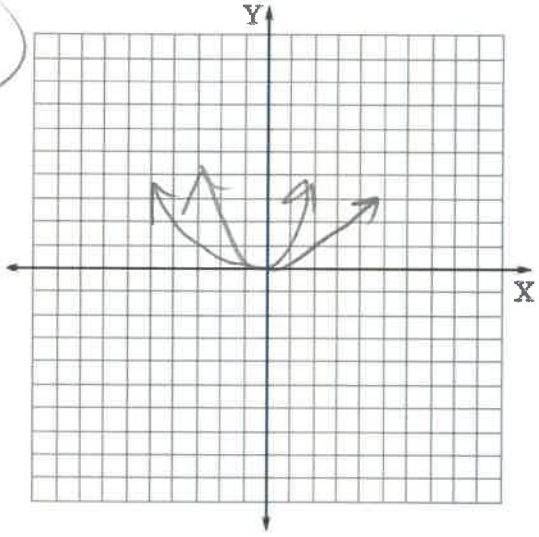

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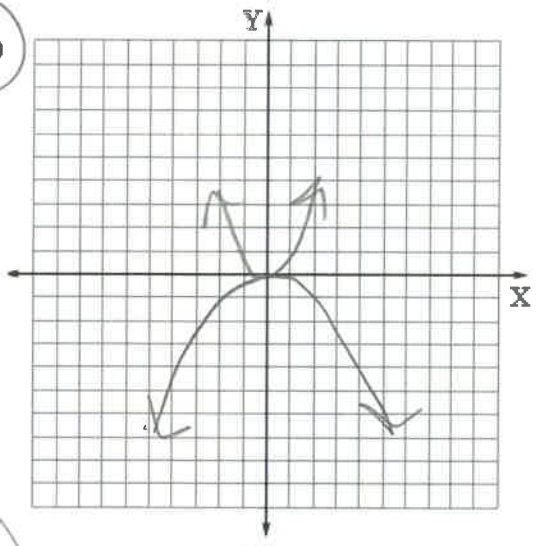

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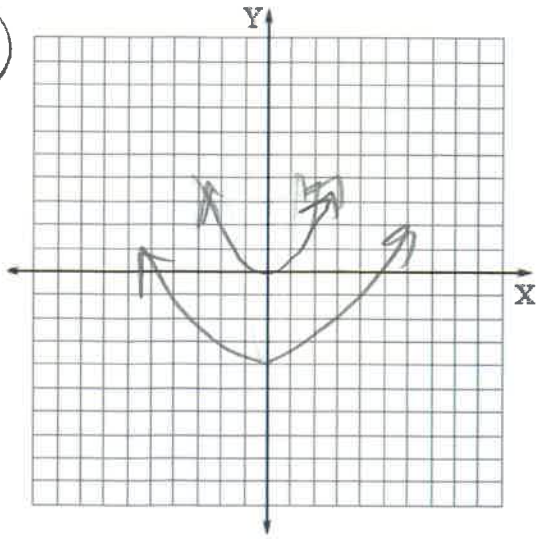

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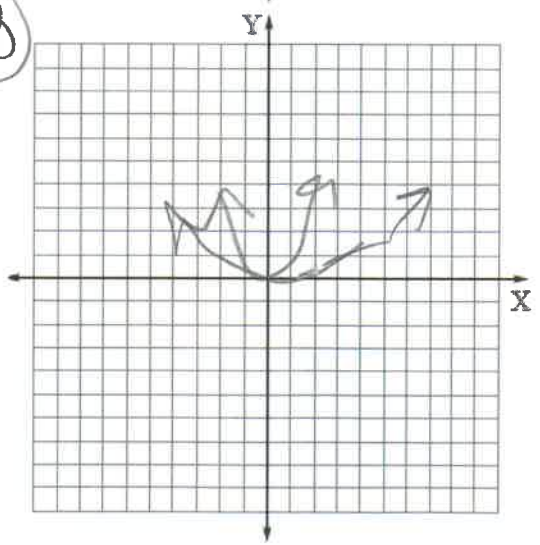


College Algebra – Chapter 8
Lesson 4

Name _____ Date _____

Describe the transformation of f represented by g.

1. $f(x) = x^4$; $g(x) = x^4 + 3$

3 units up

2. $f(x) = x^4$; $g(x) = (x - 5)^4$

5 units right

3. $f(x) = x^5$; $g(x) = (x - 2)^5 - 1$

2 units right
1 unit down

4. $f(x) = x^6$; $g(x) = (x + 1)^6 - 4$

1 unit left
4 units down

5. $f(x) = x^4$; $g(x) = -2x^4$

Vert Str by 2
reflect x-axis

6. $f(x) = x^3$; $g(x) = 5x^{3+} + 1$

Vert Str by 5
1 unit up

College Algebra – Chapter 8

Lesson 4

7. $f(x) = x^4$; $g(x) = \frac{1}{2}x^4 + 1$

Vert Shrink by $\frac{1}{2}$

1 unit 1

8. $f(x) = x^4$; $g(x) = (2x)^4 - 3$

Horizontal shrink by $\frac{1}{2}$

3 units down

Write a rule for g that represents the indicated transformation of the graph of f.

9. $f(x) = x^3 - 6$; translation 3 units left, followed by a reflection in the y-axis.

$(x+3)^3 - 6$

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

10. $f(x) = x^4 + 2x + 6$; vertical stretch by a factor of 2, followed by a translation 4 units right.

$2(x^4+2x+6)$

$2((x-4)^4 + 2(x-4) + 6)$

11. $f(x) = x^3 + 2x^2 - 9$; horizontal shrink by a factor of $\frac{1}{3}$ and a translation 2 units up, followed by a reflection in the x-axis.

$-(((3x)^3 + 2(3x)^2 - 9) + 2)$

College Algebra – Chapter 8
Lesson 5

Name _____

Match the function with its graph.

1. $f(x) = \sqrt{x+3}$ B

2. $h(x) = \sqrt{x} + 3$ D

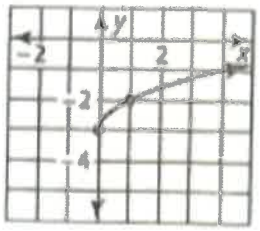
3. $f(x) = \sqrt{x-3}$ F

4. $g(x) = \sqrt{x} - 3$ A

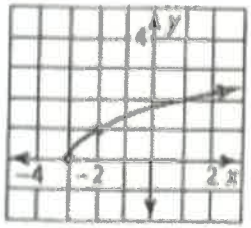
5. $h(x) = \sqrt{x+3} - 3$ E

6. $f(x) = \sqrt{x-3} + 3$ C

A.



B.



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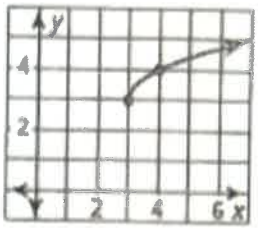
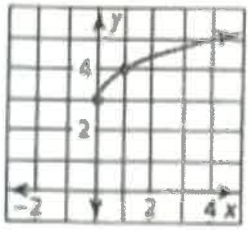
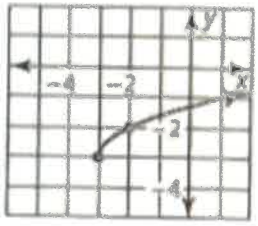


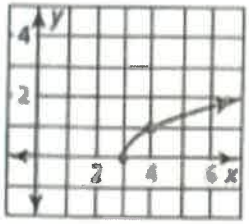
D.



E.



F.



Describe the transformation of *f* represented by *g*.

7. $f(x) = \sqrt{x}$; $g(x) = 2\sqrt{x-1}$

Vert shrink by 2
1 unit right

8. $f(x) = \sqrt[3]{x}$; $g(x) = \sqrt[3]{x+4} - 5$

4 units left
5 units down

9. $f(x) = x^{1/3}$; $g(x) = \frac{1}{2}x^{1/3} + 6$

Vert str by $\frac{1}{2}$
6 units up

10. $f(x) = \sqrt[3]{x}$; $g(x) = \sqrt[3]{-32x} + 3$

reflect y-axis
Horiz shrink by $\frac{1}{32}$
3 units up

College Algebra – Chapter 8
Lesson 5

Complete the statement with *sometimes*, *always*, or *never*.

11. The domain of the function $y = a\sqrt{x}$ is always $x \geq 0$.

12. The range of the function $y = a\sqrt{x}$ is sometimes $y \geq 0$.

Write a rule for g described by the transformations of the graph of f.

13. Let g be a vertical stretch by a factor of 2, followed by a translation 2 units up of the graph of $f(x) = \sqrt{x} + 3$.

$(2(\sqrt{x}+3))+2$

14. Let g be a horizontal shrink by a factor of $\frac{2}{3}$, followed by a translation 4 units left of the graph of $f(x) = \sqrt{6x}$.

$\sqrt{6(\frac{3}{2}x)}$

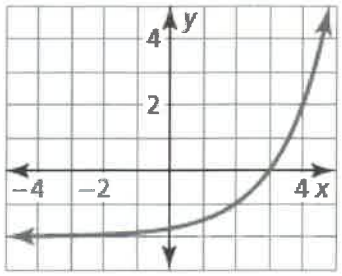
$\sqrt{6(\frac{3}{2}(x+4))}$

College Algebra – Chapter 8
Lesson 6, Day 1

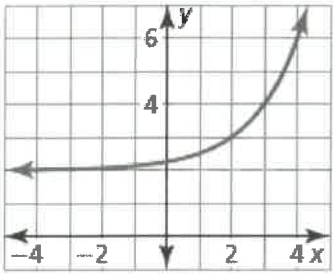
Name Key _____ Date _____

Match the function with its graph.

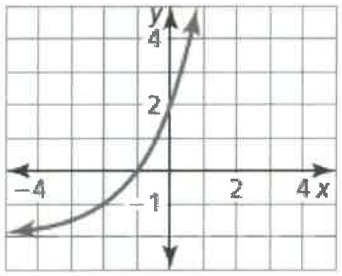
A.



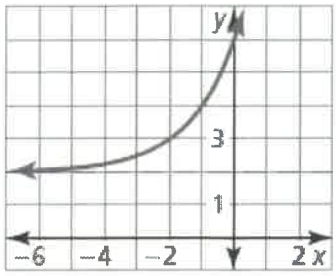
B.



C.



D.



1. $F(x) = 2^{x+2} - 2$

C

2. $G(x) = 2^{x+2} + 2$

D

3. $h(x) = 2^{x-2} - 2$

A

4. $K(x) = x^{2-x} + 2$

B

Describe the transformation of f represented by g.

5. $F(x) = 3^x$; $g(x) = 3^x + 5$

5 units up

6. $F(x) = 4^x$; $g(x) = 4^x - 8$

8 units down

7. $f(x) = e^x$; $g(x) = e^x - 1$

1 unit down

8. $F(x) = 4^x$; $g(x) = 4^{x-3} + 12$

3 units right
12 units up

9. $f(x) = 3^x$; $g(x) = 3^{x+2} - 5$

2 units left
5 units down

10. $F(x) = e^x$; $g(x) = \frac{4}{3}e^x$

Vert str by $\frac{4}{3}$

11. $f(x) = 2^x$; $g(x) = -2^{x-3}$

reflect x-axis
3 units right

12. $F(x) = e^{-x}$; $g(x) = 3e^{-6x}$

Vert str by 3
Horizontal str by $\frac{1}{6}$

College Algebra – Chapter 8
Lesson 6, Day 2

Name _____ Date _____

Describe the transformation of f represented by g.

1. $f(x) = log_4 x; g(x) = 3log_4 x - 5$

Vert str by 3
5 units down

2. $f(x) = log_{1/3} x;\ g(x) = log_{\frac{1}{3}}(-x) + 6$

reflect y-axis
6 units up

3. $f(x) = log_{1/5} x; g(x) = -log_{\frac{1}{5}}(x - 7)$

reflect x-axis
7 units right

4. $f(x) = log_2 x; g(x) = log_2(x + 2) - 3$

2 units left
3 units dow

Write a rule for g that represents the indicated transformations of the graph of f.

5. $f(x) = 5^x$, translation 2 units down, followed by a reflection in the y-axis.

$5^x - 2$

$5^{-x} - 2$

6. $f(x) = e^x$; horizontal shrink by a factor of $\frac{1}{2}$, followed by a translation 5 units up.

e^{2x}

$e^{2x} + 5$

7. $f(x) = e^{-x}$; translation 4 units right and 1 unit down, followed by a vertical shrink by a factor of $\frac{1}{3}$

$e^{-(x-4)} - 1$

$\frac{1}{3}\left(e^{-(x-4)} - 1\right)$

College Algebra – Chapter 8

Lesson 6, Day 2

Write a rule for g that represents the indicated transformation of the graph of f.

8. $f(x) = \log_5 x$; reflection in the x-axis, followed by a translation 9 units left.

$-\log_5 x$

$-\log_5(x+9)$

9. $f(x) = \log_{1/2} x$; translation 3 units left and 2 units up, followed by a reflection in the y-axis.

$(\log_{1/2}(x+3))+2$

$(\log_{1/2}((-x)+3))+2$

10. $f(x) = \ln x$; translation 3 units right and 1 unit up, followed by a horizontal stretch by a factor of 8.

$(\ln(x-3))+1$

$(\ln((\frac{1}{8}x)-3))+1$

Justify each step in writing a rule for g that represents the indicated transformations of the graph of f.

11.

$h(x) = -f(x)$ — Reflect x-axis

$= -\log_7 x$ — input function

$g(x) = h(x) - 6$ — 6 units down

$= -\log_7 x - 6$ — input function

12.

$h(x) = 4 \cdot f(x)$ — Vert Str by 4

$= 4 \cdot 8^x$ — Input function

$g(x) = h(x+3) + 1$ — 3 units left + 1 unit up

$= 4 \cdot 8^{x+3} + 1$

Key

College Algebra – Chapter 9
Lesson 1

Solve the linear system on another piece of paper.

1. $x + y - 2z = 5$
   $-x + 2y + z = 2$
   $2x + 3y - z = 9$

   $(1, 2, -1)$

2. $x + 4y - 6z = -1$
   $2x - y + 2z = -7$
   $-x + 2y - 4z = 5$

   $(-3, -1, -1)$

3. $2x + y - z = 9$
   $-x + 6y + 2z = -17$
   $5x + 7y + z = 4$

   $(3, -1, -4)$

4. $3x + 2y - z = 8$
   $-3x + 4y + 5z = -14$
   $x - 3y + 4z = -14$

   $(1, 1, -3)$

5. $2x + 2y + 5z = -1$
   $2x - y + z = 2$
   $2x + 4y - 3z = 14$

   $\left(\frac{151}{64}, \frac{9}{8}, \frac{-51}{32}\right)$

6. $3x + 2y - 3z = -2$
   $7x - 2y + 5z = -14$
   $2x + 4y + z = 6$

   $\left(\frac{-22}{13}, \frac{29}{13}, \frac{6}{13}\right)$

7. $3x - y + 2z = 4$
   $6x - 2y + 4z = -8$
   $2x - y + 3z = 10$

   No Sol

8. $5x + y - z = 6$
   $x + y + z = 2$
   $12x + 4y = 10$

   No Sol

College Algebra – Chapter 9
Lesson 2

Solve the system by substitution.

1. $y = x + 5$
$y = x^2 - x + 2$
$x^2 - x + 2 = x + 5$
$-x \quad -5 \quad -x \quad -5$
$x^2 - 2x - 3 = 0$
$(x-3)(x+1) = 0$
$x = 3 \quad x = -1$
$y = 3 + 5$ $\quad y = -1 + 5$
$y = 8 \quad y = 4$
$(3, 8)$ $\quad (-1, 4)$

2. $x^2 + y^2 = 49$
$y = 7 - x$
$x^2 + (7-x)^2 = 49$
$x^2 + (49 - 7x - 7x + x^2) = 49$
$2x^2 - 14x + 49 = 49$
$-49 \quad -49$
$2x^2 - 14x = 0$
$2x(x-7) = 0$
$2x = 0 \quad x - 7 = 0$
$x = 0 \quad x = 7$
$y = 7 - 0 \quad y = 7 - 7$
$y = 7 \quad y = 0$
$(0, 7)$ $\quad (7, 0)$

3. $x^2 + y^2 = 64$
$y = -8$
$x^2 + (-8)^2 = 64$
$x^2 + 64 = 64$
$-64 \quad -64$
$x^2 = 0$
$x = 0$
$(0, -8)$

4. $x = 3$
$-3x^2 + 4x - y = 8$
$-3(3)^2 + 4(3) - y = 8$
$-3(9) + 12 - y = 8$
$-27 + 12 - y = 8$
$-15 - y = 8$
$+15 \quad +15$
$-y = 23$
$y = -23$
$(3, -23)$

5. $2x^2 + 4x - y = -3$
$-2x + y = -4 \rightarrow y = 2x - 4$
$+2x$
$2x^2 + 4x - (2x - 4) = -3$
$2x^2 + 4x - 2x + 4 = -3$
$+3 \quad +3$
$2x^2 + 2x + 7 = 0$
Non Real Solution

6. $2x - 3 = y + 5x^2$
$y = -3x - 3$
$2x - 3 = -3x - 3 + 5x^2$
$-5x^2 + 3y + 3 \quad +3y + 3 \quad -5x^2$
$-5x^2 + 5x = 0$
$-5x(x-1) = 0$
$-5x = 0 \quad x - 1 = 0$
$x = 0 \quad x = 1$
$y = -3(0) - 3$ $\quad y = -3(1) - 3$
$y = -3 \quad y = -3 - 3$
$y = -6$
$(0, -3)$ $\quad (1, -6)$

7. $y + 16x - 22 = 4x^2 - 16x + 22$
$-16x \quad +22$
$4x^2 - 24x + 26 + y = 0$
$4x^2 - 24x + 26 + 4x^2 - 16x + 22 = 0$
$8x^2 - 40x + 48 = 0$
$8(x^2 - 5x + 6) = 0$
$8(x-2)(x-3) = 0$
$x = 2 \quad x = 3$
$y = 4x^2 - 16x + 22$
$y + 16(2) - 22 = 4(2)^2$
$y + 32 - 22 = 4(4)$
$y + 10 = 16$
$-10 \quad -10$
$y = 6$
$(2, 6)$
$x + 11(3) - 22 = 4(3)^2$
$y + 48 - 22 = 4(9)$
$y + 26 = 36$
$-26 \quad -26$
$y = 10$
$(3, 10)$

8. $x^2 + y^2 = 5$
$-x + y = -1 \quad y = x - 1$
$+x$
$x^2 + (x-1)^2 = 5$
$x^2 + x^2 - x - x + 1 = 5$
$2x^2 - 2x + 1 = 5$
$-5 \quad -5$
$2x^2 - 2x - 4 = 0$
$2(x^2 - x - 2) = 0$
$2(x-2)(x+1)$
$x = 2 \quad x = -1$
$(-2) + y = -1$ $\quad -(-1) + y = -1$
$-2 + y = -1 \quad 1 + y = -1$
$+2 \quad +2 \quad -1 \quad -1$
$y = 1 \quad y = -2$
$(-2, 1)$ $\quad (-1, -2)$

Solve the system by elimination.

9. $2x^2 - 3x - y = -5$
$-x + y = 5$
$-x \quad +y = 5$
$2x^2 - 4x = 0$
$2x(x-2) = 0$
$2x = 0 \quad x - 2 = 0$
$x = 0 \quad x = 2$
$0 + y = 5$ $\quad -(-2) + y = 5$
$y = 5 \quad -2 + y = 5$
$+2 \quad +2$
$y = 7$
$(0, 5)$ $\quad (2, 7)$

10. $-3x^2 + 2x - 5 = y$
$-x + 2 = -y$
$-3x^2 + x - 3 = 0$
$-(3x^2 - x + 3) = 0$
Non Real Solution

College Algebra – Chapter 9
Lesson 2

11. $-3x^2 + y = -18x + 29$
$-3x^2 - y = 18x - 25$
$-6x^2 = 4$
$-4 \quad -4$
$-2(3x^2+4)=0$
$3x^2 = -4$
Non Real Solution

12. $y = -x^2 - 6x - 10$
$-y = 3x^3 + 18x + 22$
$0 = -4x^2 - 24x - 32$
$4x^2+24x+32=0$
$4(x^2+6x+8)=0$
$4(x+2)(x+4)=0$
$x=-2 \quad x=-4$
$y=-(-2)^2-6(-2)-10$
$=-4+12-10$
$=-2$
$(-2,-2)$
$y=-(-4)^2-6(-4)-10$
$=-16+24-10$
$=-2$
$(-4,-2)$

13. $y = -3x^2 - 30x - 76$
$-y = 2x^2 + 20x + 44$
$0 = -5x^2 - 50x - 120$
$5x^2+50x+120=0$
$5(x^2+10x+24)=0$
$5(x+4)(x+6)=0$
$x=-4 \quad x=-6$
$y=-3(-4)^2-30(-4)-76$
$=-3(16)+120-76$
$=-48+120-76$
$=-4$
$(-4,-4)$
$y=-3(-6)^2-30(-6)-76$
$=-3(36)+180-76$
$=-108+180-76$
$=-4$
$(-3,-4)$

14. $-10x^2 + y = -80x + 155$
$+5x^2 - y = -40x - 85$
$-15x^2 = -120x + 240$
$-15x^2+120x-240=0$
$-5(3x^2-24+48)=0$
$-5(3x-8)(x-6)=0$
$3x-8=0 \quad x=6$
$+8 \quad +8$
$x = 8/3$
$-10(\frac{8}{3})^2 + y = -80(\frac{8}{3})+155$
$-10(\frac{64}{9}) + y = -\frac{640}{3}+155$
$-\frac{640}{9} + y = -\frac{1920}{9}+\frac{1395}{9}$
$-\frac{640}{9} + y = -\frac{525}{9}+\frac{640}{9}$
$+\frac{640}{9}$
$y = \frac{115}{9}$
$(\frac{8}{3}, \frac{115}{9})$
$-10(6)^2 + y = -80(6)+155$
$-10(36)+y = -480+155$
$-360+y = -325$
$+360 \quad +360$
$y = 35$
$(6,35)$

College Algebra – Chapter 9
Lesson 3

C

Match the inequality with its graph.

1. $y \le x^2 + 4x + 3$

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

$(-2)^2+4(-2)+3$
$4-8+3$
$-4+3$
-1

V(-2,-1)

Test (0,0)
$0 \le 3$ Yes!

2. $y > -x^2 + 4x - 3$

A opens down

3. $y < x^2 - 4x + 3$

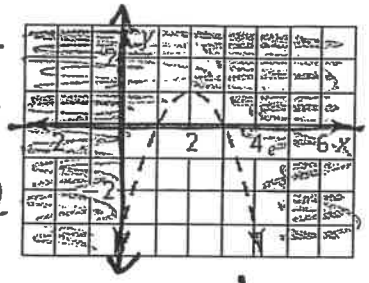
B

4. $y \ge x^2 + 4x + 3$

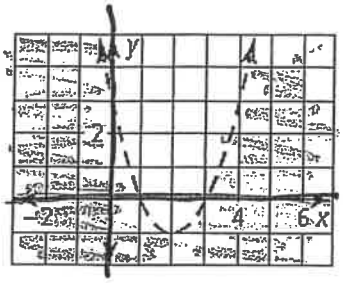
V: (-2,-1) Test (0,0)

D $0 \ge 3$ No!

A.



B.



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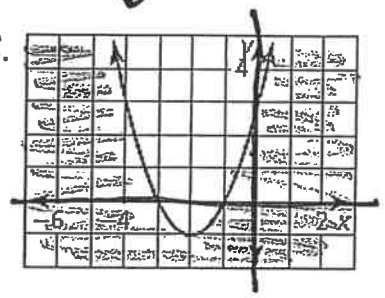
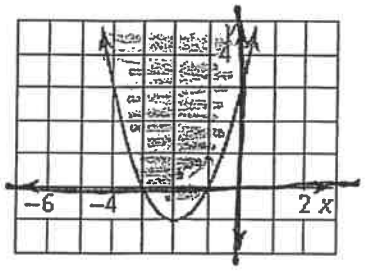
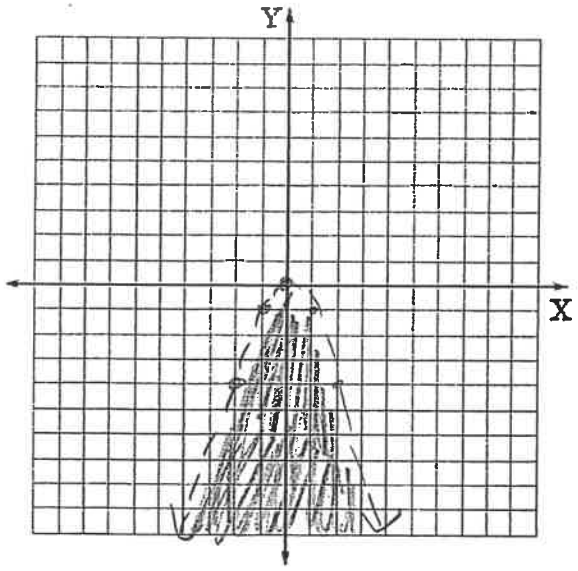


D.



Graph the inequality.

5. $Y < -x^2$



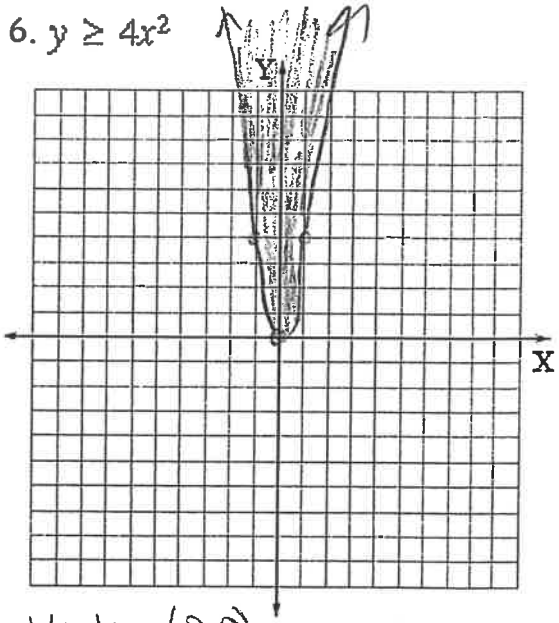
Vertex $\Rightarrow \frac{-0}{2(-1)} = 0$ $y = -(0)^2$
$= 0$
(0,0)

$f(-1) = -(-1)^2 = -1$ $(-1,-1)$
$f(-2) = -(-2)^2 = -4$ $(-2,-4)$

$<$ $\Rightarrow$ dashed

Test (0,-3)
$-3 < 0$ Yes!

6. $y \ge 4x^2$



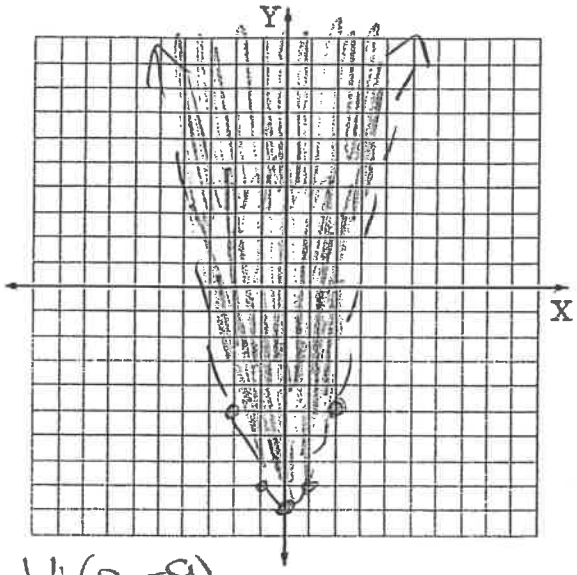
Vertex (0,0)
$f(1) = 4(1)^2 = 4(1) = 4$ (1,4)
$f(2) = 4(2)^2 = 4(4) = 16$ (2,16)

$\ge$ $\Rightarrow$ Solid

Test (0,5)
$5 \ge 4(0)^2$
$5 \ge 0$ Yes!

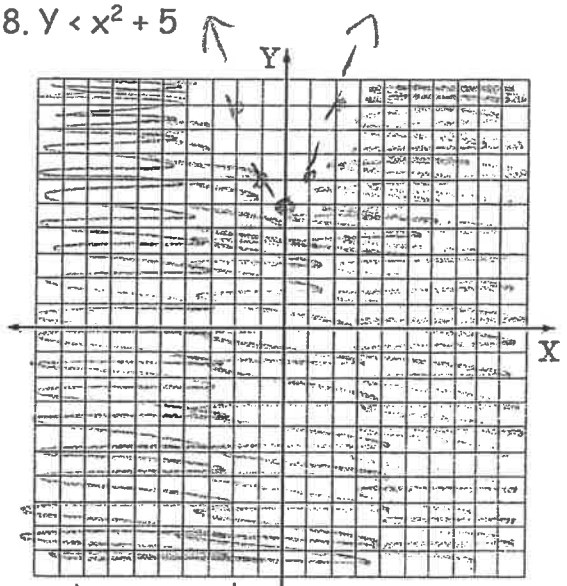
College Algebra – Chapter 9
Lesson 3

7. $y > x^2 - 9$



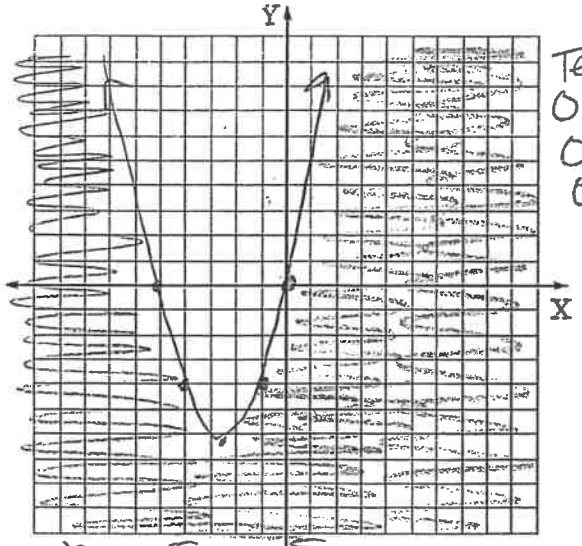
V: (0, −9)
f(1) = (1)² − 9 ⇒ 1 − 9 ⇒ −8 (1, −8)
f(2) = (2)² − 9 ⇒ 4 − 9 ⇒ −5 (2, −5)
> ⇒ dashed
Test (0,0)
0 > 0 − 9
0 > −9 Yes.

8. $y < x^2 + 5$



Vertex: (0, 5)
f(1) = (1)² + 5 = 1 + 5 = 6 (1, 6)
f(2) = (2)² + 5 = 4 + 5 = 9 (2, 9)
< ⇒ dashed
Test (0,0)
0 < 0 + 5
0 < 5 Yes.

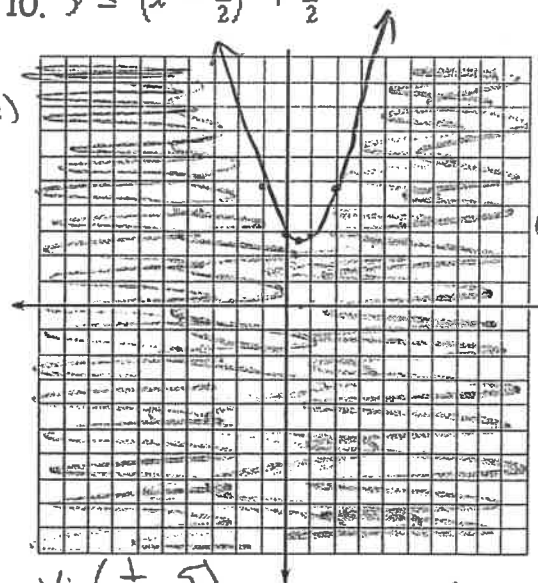
9. $y \leq x^2 + 5x$



Test (−2, 0)
0 ≤ (−2)² + 5(−2)
0 ≤ 4 − 10
0 ≤ −6
No.

V: $\frac{-b}{2a} = \frac{-5}{2(1)} = -\frac{5}{2}$
$(-\frac{5}{2})^2 + 5(-\frac{5}{2}) \Rightarrow \frac{25}{4} - \frac{25}{2}(\frac{2}{2}) = \frac{-25}{4}$
$(-\frac{5}{2}, -\frac{25}{4})$
f(−1) = (−1)² + 5(−1) ⇒ 1 − 5 = −4 (−1, −4)
f(0) = (0) + 5(0) = 0 (0, 0)
≤ ⇒ solid

10. $y \leq (x - \frac{1}{2})^2 + \frac{5}{2}$



Test (0,0)
$0 \leq (0 - \frac{1}{2})^2 + \frac{5}{2}$
$0 \leq (-\frac{1}{2})^2 + \frac{5}{2}$
$0 \leq \frac{1}{4} + \frac{10}{4}$
$0 \leq \frac{11}{4}$
Yes.

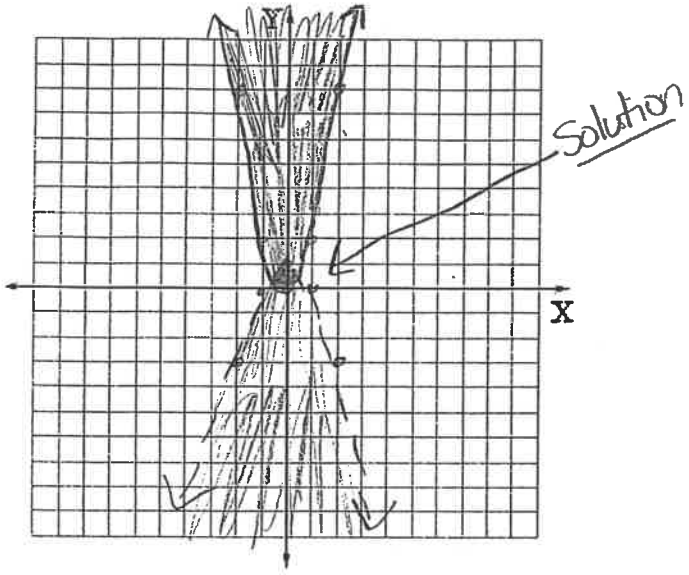
V: $(\frac{1}{2}, \frac{5}{2})$
$f(0) = (0 - \frac{1}{2})^2 + \frac{5}{2} \Rightarrow (-\frac{1}{2})^2 + \frac{5}{2} = \frac{1}{4} + \frac{10}{4} = \frac{11}{4}$ $(0, \frac{11}{4})$
$f(2) = (2 - \frac{1}{2})^2 + \frac{5}{2} \Rightarrow (\frac{3}{2})^2 + \frac{5}{2} \Rightarrow \frac{9}{4} + \frac{10}{4} = \frac{19}{4}$ $(2, \frac{19}{4})$
≤ ⇒ solid

College Algebra – Chapter 9
Lesson 3

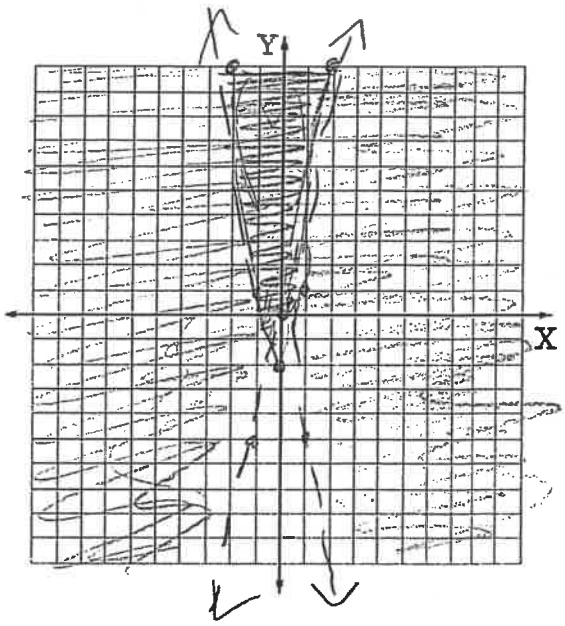
*Work is on back of this worksheet.

Graph the system of quadratic inequalities.

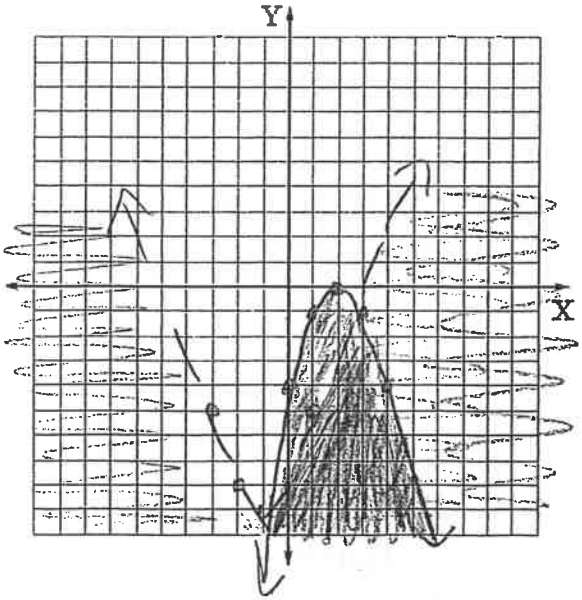
11. $y \geq 2x^2$
$y < -x^2 + 1$



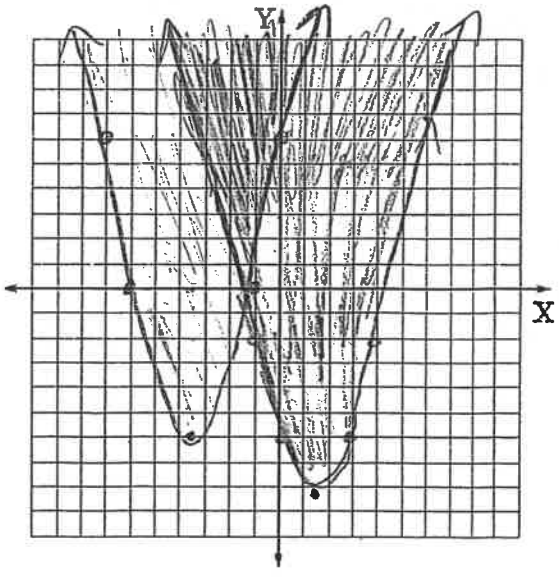
12. $y > -5x^2$
$y > 3x^2 - 2$



13. $y \leq -x^2 + 4x - 4$
$y < x^2 + 2x - 8$



14. $y \geq x^2 - 3x - 6$
$y \geq x^2 + 7x + 6$



College Algebra – Chapter 9
Lesson 3

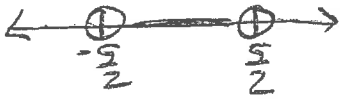
Solve the inequality algebraically.

15. $4x^2 < 25$

$\frac{4x^2}{4} = \frac{25}{4}$

$\sqrt{x^2} = \sqrt{\frac{25}{4}}$

$x = \pm\frac{5}{2}$



Test -3: $4(-3)^2 < 25$; $4(9) < 25$; $36 < 25$; No!

Test 0: $4(0)^2 < 25$; $4(0) < 25$; $0 < 25$; Yes!

Test 3: $4(3)^2 < 25$; $4(9) < 25$; $36 < 25$; No.

$\boxed{-\frac{5}{2} < x < \frac{5}{2}}$

16. $x^2 + 10x + 9 < 0$

$(x+9)(x+1) = 0$

$x = -9 \quad x = -1$

Test -12: $(-12)^2 + 10(-2) + 9 < 0$; $144 - 20 + 9 < 0$; $124 + 9 < 0$; $133 < 0$; No!

Test -5: $(-5)^2 + 10(-5) + 9 < 0$; $25 - 50 + 9 < 0$; $-25 + 9 < 0$; $-16 < 0$; Yes

Test 0: $(0)^2 + 10(0) + 9 < 0$; $9 < 0$; NO!

$\boxed{-9 < x < -1}$

17. $x^2 - 11x \geq -28$

$x^2 - 11x + 28 = 0$

$(x-7)(x-4)$

$x = 7 \quad x = 4$

Test 0: $0^2 - 11(0) \geq -28$; $0 - 0 \geq -28$; $0 \geq -28$; Yes!

Test 5: $(5)^2 - 11(5) \geq -28$; $25 - 55 \geq -28$; $-30 \geq -28$; No!

Test 9: $(9)^2 - 11(9) \geq -28$; $81 - 99 \geq -28$; $-18 \geq -28$; Yes.

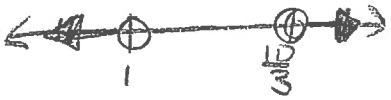
$\boxed{x \leq 4 \text{ OR } x \geq 7}$

18. $3x^2 - 13x > -10$

$3x^2 - 13x + 10 = 0$

$(3x-10)(x-1) = 0$

$x = \frac{10}{3} \quad x = 1$



Test 0: $3(0)^2 - 13(0) > -10$; $0 > -10$; Yes!

Test 2: $3(2)^2 - 13(2) > -10$; $3(4) - 26 > -10$; $12 - 26 > -10$; $-14 > -10$; No!

Test 4: $3(4)^2 - 13(4) > -10$; $3(16) - 52 > -10$; $48 - 52 > -10$; $-4 > -10$; Yes!

$\boxed{x < 1 \text{ OR } x > \frac{10}{3}}$

19. $3x^2 - 8 \leq -2x$

$3x^2 + 2x - 8$

$(3x-4)(x+2)$

$x = \frac{4}{3} \quad x = -2$

Test -3: $3(-3)^2 - 8 \leq -2(-3)$; $3(9) - 8 \leq 6$; $27 - 8 \leq 6$; $19 \leq 6$; No!

Test 0: $3(0)^2 - 8 \leq -2(0)$; $0 - 8 \leq 0$; $-8 \leq 0$; Yes!

Test 3: $3(3)^2 - 8 \leq -2(3)$; $3(9) - 8 \leq -6$; $27 - 8 \leq -6$; $19 \leq -6$; NO!

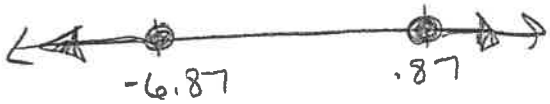
$\boxed{-2 \leq x \leq \frac{4}{3}}$

20. $\frac{1}{3}x^2 + 2x \geq 2$

$\frac{1}{3}x^2 + 2x - 2$

$\frac{-2 \pm \sqrt{(2)^2 - 4(\frac{1}{3})(-2)}}{2(\frac{1}{3})} \Rightarrow \frac{-2 \pm \sqrt{4 + \frac{8}{3}}}{\frac{2}{3}} \Rightarrow \frac{-2 \pm \sqrt{\frac{20}{3}}}{2/3}$

$\approx .87 \text{ or } -6.87$



Test -8: $\frac{1}{3}(-8)^2 + 2(-8) \geq 2$; $\frac{1}{3}(64) - 16 \geq 2$; $\frac{64}{3} - 16 \geq 2$; $\frac{16}{3} \geq 2$; Yes!

Test -3: $\frac{1}{3}(-3)^2 + 2(-3) \geq 2$; $\frac{1}{3}(9) - 6 \geq 2$; $3 - 6 \geq 2$; $-3 \geq 2$; No!

Test 3: $\frac{1}{3}(3)^2 + 2(3) \geq 2$; $\frac{1}{3}(9) + 6 \geq 2$; $3 + 6 \geq 2$; $9 \geq 2$; Yes!

$\boxed{x \leq -6.87 \text{ OR } x \geq .87}$

College Algebra – Chapter 9
Lesson 4

Find the Values of all Variables:

1. $\begin{bmatrix} 2 \\ -3 \end{bmatrix} = \begin{bmatrix} x \\ u \end{bmatrix}$

$x = 2$

$u = -3$

2. $\begin{bmatrix} -\frac{y}{2} \\ x \end{bmatrix} = \begin{bmatrix} 4 \\ 3 \end{bmatrix}$

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

$x^2 = 3$

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

3. $\begin{bmatrix} 2 & x \\ y & -3 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 3 & -3 \end{bmatrix}$

$x = -1$

$y = 3$

4. $\begin{bmatrix} 2-x & 1 \\ -2 & 3+y \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -2 & -3 \end{bmatrix}$

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

$-x = 0$

$\boxed{x = 0}$

$3 + y = -3$ $\quad -3 \quad -3$

$\boxed{y = -6}$

Find each of the following, if possible.

a) $A + B$ b) $A - B$

c) $-3A$ d) $3A - 2B$

5. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} -1 & 0 \\ 2 & -3 \end{bmatrix}$

a) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} + \begin{bmatrix} -1 & 0 \\ 2 & -3 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ 5 & 1 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} - \begin{bmatrix} -1 & 0 \\ 2 & -3 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 1 & 7 \end{bmatrix}$

c) $-3\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} -3 & -6 \\ -9 & -12 \end{bmatrix}$

d) $3\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} - 2\begin{bmatrix} -1 & 0 \\ 2 & -3 \end{bmatrix}$

$\begin{bmatrix} 3 & 6 \\ 9 & 12 \end{bmatrix} - \begin{bmatrix} -2 & 0 \\ 4 & -6 \end{bmatrix}$

$\begin{bmatrix} 5 & 6 \\ 5 & 18 \end{bmatrix}$

6. $A = \begin{bmatrix} \frac{1}{3} & 1 \\ -1 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 2 & -\frac{1}{2} \end{bmatrix}$

a) $\begin{bmatrix} \frac{1}{3} & 1 \\ -1 & 2 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 2 & -\frac{1}{2} \end{bmatrix} = \begin{bmatrix} \frac{4}{3} & 1 \\ 1 & 2\frac{1}{2} \end{bmatrix}$

b) $\begin{bmatrix} \frac{1}{3} & 1 \\ -1 & 2 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 2 & -\frac{1}{2} \end{bmatrix} = \begin{bmatrix} -\frac{2}{3} & 1 \\ -3 & 2\frac{1}{2} \end{bmatrix}$

c) $-3\begin{bmatrix} \frac{1}{3} & 1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} -1 & -3 \\ 3 & -6 \end{bmatrix}$

d) $3\begin{bmatrix} \frac{1}{3} & 1 \\ -1 & 2 \end{bmatrix} - 2\begin{bmatrix} 1 & 0 \\ 2 & -\frac{1}{2} \end{bmatrix}$

$\begin{bmatrix} 1 & 3 \\ -3 & 6 \end{bmatrix} - \begin{bmatrix} 2 & 0 \\ 4 & -1 \end{bmatrix}$

$\begin{bmatrix} -1 & 3 \\ -7 & 7 \end{bmatrix}$

7. $A = \begin{bmatrix} 4 & 0 & -1 \\ -2 & 5 & 2 \\ 0 & 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 3 & 1 & 0 \\ 1 & -4 & 2 \\ 2 & 1 & 3 \end{bmatrix}$

a) $\begin{bmatrix} 4 & 0 & -1 \\ -2 & 5 & 2 \\ 0 & 0 & 1 \end{bmatrix} + \begin{bmatrix} 3 & 1 & 0 \\ 1 & -4 & 2 \\ 2 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 7 & 1 & -1 \\ -1 & 1 & 4 \\ 2 & 1 & 4 \end{bmatrix}$

b) $\begin{bmatrix} 4 & 0 & -1 \\ -2 & 5 & 2 \\ 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 3 & 1 & 0 \\ 1 & -4 & 2 \\ 2 & 1 & 0 \end{bmatrix} = \begin{bmatrix} 1 & -1 & -1 \\ -3 & 9 & 0 \\ -2 & -1 & 1 \end{bmatrix}$

c) $-3\begin{bmatrix} 4 & 0 & -1 \\ -2 & 5 & 2 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} -12 & 0 & 3 \\ 6 & -15 & -6 \\ 0 & 0 & -3 \end{bmatrix}$

d) $3\begin{bmatrix} 4 & 0 & -1 \\ -2 & 5 & 2 \\ 0 & 0 & 1 \end{bmatrix} - 2\begin{bmatrix} 3 & 1 & 0 \\ 1 & -4 & 2 \\ 2 & 1 & 3 \end{bmatrix}$

$\begin{bmatrix} 12 & 0 & -3 \\ -6 & 15 & 6 \\ 0 & 0 & 3 \end{bmatrix} - \begin{bmatrix} 6 & 2 & 0 \\ 2 & -8 & 4 \\ 4 & 2 & 6 \end{bmatrix}$

$\begin{bmatrix} 6 & -2 & -3 \\ -8 & 23 & -10 \\ -4 & -2 & -3 \end{bmatrix}$

College Algebra – Chapter 9
Lesson 5

Find each product, if possible.

A) AB

2x2 2x2 Yes! 2x2 Result

1. $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} -2 & 1 \\ 3 & 5 \end{bmatrix}$

a) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} -2 & 1 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 1(-2)+2(3) & 1(1)+2(5) \\ 3(-2)+4(3) & 3(1)+4(5) \end{bmatrix}$

$\begin{bmatrix} -2+6 & 1+10 \\ -6+12 & 3+20 \end{bmatrix} = \begin{bmatrix} 4 & 11 \\ 6 & 23 \end{bmatrix}$

b) $\begin{bmatrix} -2 & 1 \\ 3 & 5 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \Rightarrow \begin{bmatrix} -2(1)+1(3) & -2(2)+1(4) \\ 3(1)+5(3) & 3(2)+5(4) \end{bmatrix}$

$\begin{bmatrix} -2+3 & -4+4 \\ 3+15 & 6+20 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 18 & 26 \end{bmatrix}$

b) BA

3x2 2x3 Yes! 3x3 Result

2. $A = \begin{bmatrix} 3 & 2 \\ 1 & 5 \\ 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 & -2 \\ 2 & 5 & 0 \end{bmatrix}$

a) $\begin{bmatrix} 3 & 2 \\ 1 & 5 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 3 & -2 \\ 2 & 5 & 0 \end{bmatrix} \Rightarrow$

$\begin{bmatrix} 3(1)+2(2) & 3(3)+2(5) & 3(-2)+2(0) \\ 1(1)+5(2) & 1(3)+5(5) & 1(-2)+5(0) \\ 0(1)+1(2) & 0(3)+1(5) & 0(-2)+1(0) \end{bmatrix} \Rightarrow$

$\begin{bmatrix} 3+4 & 9+10 & -6+0 \\ 1+10 & 3+25 & -2+0 \\ 0+2 & 0+5 & 0+0 \end{bmatrix} = \begin{bmatrix} 7 & 19 & -6 \\ 11 & 28 & -2 \\ 2 & 5 & 0 \end{bmatrix}$

b) 2x3 3x2 Yes 2x2 Result

$\begin{bmatrix} 1 & 3 & -2 \\ 2 & 5 & 0 \end{bmatrix}\begin{bmatrix} 3 & 2 \\ 1 & 5 \\ 0 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 1(3)+3(1)+-2(0) & 1(2)+3(5)+2(\\ 2(3)+5(1)+0(0) & 2(2)+5(5)+0(1) \end{bmatrix}$

$\begin{bmatrix} 3+3+0 & 2+15-2 \\ 6+5+0 & 4+25+0 \end{bmatrix} = \begin{bmatrix} 6 & 15 \\ 11 & 29 \end{bmatrix}$

3. $A = \begin{bmatrix} 2 & -1 & 0 \\ -3 & 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 5 \\ -2 & 3 \\ 4 & 0 \end{bmatrix}$

a) 2x3 3x2 Yes 2x2 Result

$\begin{bmatrix} 2 & -1 & 0 \\ -3 & 1 & 2 \end{bmatrix}\begin{bmatrix} 1 & 5 \\ -2 & 3 \\ 4 & 0 \end{bmatrix}$

$\begin{bmatrix} 2(1)+-1(-2)+0(4) & 2(5)+-1(3)+0(0) \\ -3(1)+1(-2)+2(4) & -3(5)+1(3)+2(0) \end{bmatrix}$

$\begin{bmatrix} 2+2+0 & 10-3+0 \\ -3-2+8 & -15+3+0 \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 3 & -12 \end{bmatrix}$

b) $\begin{bmatrix} 1 & 5 \\ -2 & 3 \\ 4 & 0 \end{bmatrix}\begin{bmatrix} 2 & -1 & 0 \\ -3 & 1 & 2 \end{bmatrix}$ 3x2 2x3 Yes 3X3 Result

$\begin{bmatrix} 1(2)+5(-3) & 1(-1)+5(1) & 1(0)+5(2) \\ -2(2)+3(-3) & -2(-1)+3(1) & -2(0)+3(2) \\ 4(2)+0(-3) & 4(-1)+0(1) & 4(0)+0(2) \end{bmatrix}$

$\begin{bmatrix} 2-15 & -1+5 & 0+10 \\ -4-9 & 2+3 & 0+6 \\ 8+0 & -4+0 & 0+0 \end{bmatrix}$

$\begin{bmatrix} -13 & 4 & 10 \\ -13 & 5 & 6 \\ 8 & -4 & 0 \end{bmatrix}$

4. $A = \begin{bmatrix} 2 & 0 & 1 \\ 1 & 4 & 2 \\ 3 & -1 & 0 \end{bmatrix}, B = \begin{bmatrix} 3 & 1 & 0 \\ -1 & 2 & 0 \\ 4 & 5 & 2 \end{bmatrix}$

3x3 3x3 Yes 3x3 Result

a) $\begin{bmatrix} 2 & 0 & 1 \\ 1 & 4 & 2 \\ 3 & -1 & 0 \end{bmatrix}\begin{bmatrix} 3 & 1 & 0 \\ -1 & 2 & 0 \\ 4 & 5 & 2 \end{bmatrix}$

$\begin{bmatrix} 2(3)+0(-1)+1(4) & 3(1)+0(2)+1(5) & 2(0)+0(0)+1(2) \\ 1(3)+4(-1)+2(4) & 1(1)+4(2)+2(5) & 1(0)+4(0)+2(2) \\ 3(3)+-1(-1)+0(4) & 3(1)+-1(2)+0(5) & 3(0)+-1(0)+0(2) \end{bmatrix}$

$\begin{bmatrix} 6+0+4 & 3+0+5 & 0+0+2 \\ 3-4+8 & 1+8+10 & 0+0+4 \\ 9+1+0 & 3-2+0 & 0+0+0 \end{bmatrix} = \begin{bmatrix} 10 & 8 & 2 \\ 7 & 19 & 4 \\ 10 & 1 & 0 \end{bmatrix}$

b) $\begin{bmatrix} 3 & 1 & 0 \\ -1 & 2 & 0 \\ 4 & 5 & 2 \end{bmatrix}\begin{bmatrix} 2 & 0 & 1 \\ 1 & 4 & 2 \\ 3 & -1 & 0 \end{bmatrix}$

$\begin{bmatrix} 3(2)+1(1)+0(3) & 3(0)+1(4)+0(-1) & 3(1)+1(2)+0(0) \\ -1(2)+2(1)+0(3) & -1(0)+2(4)+0(-1) & -1(1)+2(2)+0(0) \\ 4(2)+5(1)+2(3) & 4(0)+5(4)+2(-1) & 4(1)+5(2)+2(-1) \end{bmatrix}$

$\begin{bmatrix} 6+1+0 & 0+4+0 & 3+2+0 \\ -2+2+0 & 0+8+0 & -1+4+0 \\ 8+5+6 & 0+20-2 & 4+10-2 \end{bmatrix} = \begin{bmatrix} 7 & 4 & 5 \\ 0 & 8 & 3 \\ 19 & 18 & 12 \end{bmatrix}$

College Algebra – Chapter 9
Lesson 5

5. $A = [1 \quad 2 \quad 3]$, $B = \begin{bmatrix} 1 & 2 & -1 \\ 0 & 3 & 1 \\ 2 & 0 & -3 \end{bmatrix}$

a) $1\times3 \quad 3\times3$ 1×3 Result

Yes

$$\begin{bmatrix} 1 & 2 & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 & -1 \\ 0 & 3 & 1 \\ 2 & 0 & -3 \end{bmatrix}$$

$$\begin{bmatrix} 1(1)+2(0)+3(2) & 1(2)+2(3)+3(0) & 1(-1)+2(1)+3(-3) \end{bmatrix}$$

$$\begin{bmatrix} 1+0+6 & 2+6+0 & -1+2-9 \end{bmatrix} = \begin{bmatrix} 7 & 8 & -8 \end{bmatrix}$$

b) $3\times3 \quad 1\times3$

No!

6. $A = \begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$, $B = [-3 \quad 0 \quad 2]$

a) $3\times1 \quad 1\times3$ 3×3 Result

Yes

$$\begin{bmatrix} 1(-3) & 1(0) & 1(2) \\ 2(-3) & 2(0) & 2(2) \\ -1(-3) & -1(0) & -1(2) \end{bmatrix} = \begin{bmatrix} -3 & 0 & 2 \\ -6 & 0 & 4 \\ 3 & 0 & -2 \end{bmatrix}$$

b) $1\times3 \quad 3\times1$ 1×1 Result

Yes

$$\begin{bmatrix} -3 & 0 & 2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} -3(1)+0(2)+2(-1) \end{bmatrix}$$

$$\begin{bmatrix} -3+0-2 \end{bmatrix} = \begin{bmatrix} -5 \end{bmatrix}$$

College Algebra – Chapter 9
Lesson 6

Evaluate the determinant.

1. $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ $2(5)-4(3) \Rightarrow 10-12$

$= \boxed{-2}$

2. $\begin{bmatrix} 3 & 5 \\ 1 & 4 \end{bmatrix}$ $3(4)-1(5)$

$12-(5)$

$12+5$

$\boxed{17}$

3. $\begin{bmatrix} 4 & -2 \\ 3 & -3 \end{bmatrix}$ $4(-3)-3(-2)$

$-12-(-6)$

$-12+6$

$\boxed{-6}$

4. $\begin{bmatrix} \frac{1}{2} & \frac{1}{3} \\ \frac{1}{4} & \frac{1}{6} \end{bmatrix}$ $\frac{1}{2}\left(\frac{1}{6}\right)-\frac{1}{4}\left(\frac{1}{3}\right)$

$\frac{1}{12}-\frac{1}{12}$

$\boxed{0}$

5. $\begin{bmatrix} 1 & 0 & -1 \\ 0 & 3 & 4 \\ 0 & 0 & 4 \end{bmatrix} \begin{matrix} 1 & 0 \\ 0 & 3 \\ 0 & 0 \end{matrix}$

$[1(3)(4)+0(4)(0)+(-1)(0)(0)]-[(0)(3)(-1)+(0)(4)(1)+(4)(0)(0)]$

$[12+0+0]-[0+0+0]$

$12-0$

$\boxed{12}$

6. $\begin{bmatrix} 2 & 3 & 4 \\ 0 & -4 & 6 \\ 0 & 0 & -5 \end{bmatrix} \begin{matrix} 2 & 3 \\ 0 & -4 \\ 0 & 0 \end{matrix}$

$[2(-4)(-5)+(3)(6)(0)+(4)(0)(0)]-[0(-4)(4)+(0)(6)(2)+(-5)(0)(3)]$

$[40+0+0]-[0+0+0]$

$40-0$

$\boxed{40}$

7. $\begin{bmatrix} a & b & 0 \\ 0 & a & b \\ b & 0 & a \end{bmatrix} \begin{matrix} a & b \\ 0 & a \\ b & 0 \end{matrix}$

$[(a)(a)(a)+(b)(b)(b)+(0)(0)(0)]-[(b)(a)(0)+(0)(b)(a)+(a)(0)(b)]$

$[a^3+b^3+0]-[0+0+0]$

a^3+b^3-0

$\boxed{a^3b^3}$

8. $\begin{bmatrix} a & b & c \\ c & a & b \\ b & c & a \end{bmatrix} \begin{matrix} a & b \\ c & a \\ b & c \end{matrix}$

$[(a)(a)(a)+(b)(b)(c)+(c)(c)(b)]-[(b)(c)(c)+(c)(b)(a)+(a)(a)(b)]$

$[a^3+b^3+c^3]-[abc+abc+abc]$

$\boxed{a^3+b^3+c^3-3abc}$

College Algebra – Chapter 9
Lesson 6
Use Cramer's Rule (if applicable) to solve each system of equations.

9. $x + y = 8$
$x - y = -2$

$\text{Det}\begin{bmatrix}1 & 1\\ 1 & -1\end{bmatrix} \Rightarrow (1)(-1)-(1)(1) \Rightarrow -1-1=-2$

$x=\dfrac{\begin{bmatrix}8 & 1\\ -2 & -1\end{bmatrix}}{-2} \Rightarrow \dfrac{(8)(-1)-(-2)(1)}{-2} \Rightarrow \dfrac{-8+2}{-2} \Rightarrow \dfrac{-6}{-2}=3$

$y=\dfrac{\begin{bmatrix}1 & 8\\ 1 & -2\end{bmatrix}}{-2} \Rightarrow \dfrac{(1)(-2)-(1)(8)}{-2} \Rightarrow \dfrac{-2-8}{-2} \Rightarrow \dfrac{-10}{-2}=5$

$(3,5)$

10. $2x - 3y = 4$
$4x - 6y = 8$

$\text{Det}\begin{bmatrix}2 & -3\\ 4 & -6\end{bmatrix} \Rightarrow (2)(-6)-(-3)(4) \Rightarrow -12+12=0$

Cannot use Cramer's Rule

11. $2x + 9y = 4$
$3x - 2y = 6$

$\text{Det}\begin{bmatrix}2 & 9\\ 3 & -2\end{bmatrix} \Rightarrow (2)(-2)-(3)(9) \Rightarrow -4-27=-31$

$x=\dfrac{\begin{bmatrix}4 & 9\\ 6 & -2\end{bmatrix}}{-31} \Rightarrow \dfrac{(4)(-2)-(9)(6)}{-31} \Rightarrow \dfrac{-8-54}{-31} \Rightarrow \dfrac{-62}{-31}=2$

$y=\dfrac{\begin{bmatrix}2 & 4\\ 3 & 6\end{bmatrix}}{-31} \Rightarrow \dfrac{(2)(6)-(3)(4)}{-31} \Rightarrow \dfrac{12-12}{-31} \Rightarrow \dfrac{0}{-31}=0$

$(2,0)$

12. $5x + 3y = 1$
$2x - 5y = -12$

$\det\begin{bmatrix}5 & 3\\ 2 & -5\end{bmatrix} \Rightarrow (5)(-5)-(2)(3) \Rightarrow -25-6=-31$

$x=\dfrac{\begin{bmatrix}1 & 3\\ -12 & -5\end{bmatrix}}{-31} \Rightarrow \dfrac{(1)(-5)-(-12)(3)}{-31} \Rightarrow \dfrac{-5+36}{-31} \Rightarrow \dfrac{31}{-31}=-1$

$y=\dfrac{\begin{bmatrix}5 & 1\\ 2 & -12\end{bmatrix}}{-31} \Rightarrow \dfrac{(5)(-12)-(2)(1)}{-31} \Rightarrow \dfrac{-60-2}{-31} \Rightarrow \dfrac{-62}{-31}=2$

$(-1,2)$

13. $x + y + z = 3$
$2x - 3y + 5z = 4$
$x + 2y - 4z = -1$

$(1,1,1)$

*work on back

14. $X + 2y - z = 3$
$3x - y + z = 8$
$x + y + z = 0$

$(3,-1,-2)$

*work on back

13. $x+y+z=3$
$2x-3y+5z=4$
$x+2y-4z=-1$

$\det\begin{bmatrix}1&1&1\\2&-3&5\\1&2&-4\end{bmatrix}\begin{matrix}1&1\\2&-3\\1&2\end{matrix} \Rightarrow [(1)(-3)(-4)+(1)(5)(1)+(1)(2)(2)]-[(1)(-3)(1)+(2)(5)(1)+(-4)(2)(1)]$

$[12+5+4]-[-3+10-8] \Rightarrow 22-(-1)=22$

$x=\dfrac{\begin{bmatrix}3&1&1\\4&-3&5\\-1&2&-4\end{bmatrix}\begin{matrix}3&1\\4&-3\\-1&2\end{matrix}}{22} \Rightarrow \dfrac{[(3)(-3)(-4)+(1)(5)(-1)+(1)(4)(2)]-[(-1)(-3)(1)+(2)(5)(3)+(-4)(4)(1)]}{22}$

$\dfrac{[36-5+8]-[3+30-16]}{22} \Rightarrow \dfrac{39-17}{22} \Rightarrow \dfrac{22}{22}=1$

$y=\dfrac{\begin{bmatrix}1&3&1\\2&4&5\\1&-1&-4\end{bmatrix}\begin{matrix}1&3\\2&4\\1&-1\end{matrix}}{22} \Rightarrow \dfrac{[(1)(4)(-4)+(3)(5)(1)+(1)(2)(-1)]-[(1)(4)(1)+(-1)(5)(1)+(-4)(2)(3)]}{22}$

$\dfrac{[-16+15-2]-[4-5-24]}{22} \Rightarrow \dfrac{-3+(+25)}{22} \Rightarrow \dfrac{22}{22}=1$

$z=\dfrac{\begin{bmatrix}1&1&3\\2&-3&4\\1&2&-1\end{bmatrix}\begin{matrix}1&1\\2&-3\\1&2\end{matrix}}{22} \Rightarrow \dfrac{[(1)(-3)(-1)+(1)(4)(1)+(3)(2)(2)]-[(1)(-3)(3)+(2)(4)(1)+(-1)(2)(1)]}{22}$

$\dfrac{[3+4+12]-[-9+8-2]}{22} \Rightarrow \dfrac{19+(+3)}{22} \Rightarrow \dfrac{22}{22}=1$

$\boxed{(1,1,1)}$

14. $x+2y-z=3$
$3x-y+z=8$
$x+y+z=0$

$\det \begin{bmatrix} 1 & 2 & -1 \\ 3 & -1 & 1 \\ 1 & 1 & 1 \end{bmatrix} \begin{matrix} 1 & 2 \\ 3 & -1 \\ 1 & 1 \end{matrix} \Rightarrow \underbrace{[(1)(-1)(1)+(2)(1)(1)+(-1)(3)(1)]-[(1)(-1)(-1)+(1)(1)(1)+(1)(3)(2)]}_{-10}$

$[-1+2-3]-[1+1+6] \Rightarrow -2-8=-10$

$x=\begin{bmatrix} 3 & 2 & -1 \\ 8 & -1 & 1 \\ 0 & 1 & 1 \end{bmatrix} \begin{matrix} 3 & 2 \\ 8 & -1 \\ 0 & 1 \end{matrix} \Rightarrow \underbrace{[(3)(-1)(1)+(2)(1)(0)+(-1)(8)(1)]-[(0)(-1)(-1)+(1)(1)(3)+(1)(8)(2)]}_{-10}$

-10

$\underbrace{[-3+0-8]-[0+3+16]}_{-10} \Rightarrow \frac{-11-19}{-10} \Rightarrow \frac{-30}{-10}=3$

$y=\begin{bmatrix} 1 & 3 & -1 \\ 3 & 8 & 1 \\ 1 & 0 & 1 \end{bmatrix} \begin{matrix} 1 & 3 \\ 3 & 8 \\ 1 & 0 \end{matrix} \Rightarrow \underbrace{[(1)(8)(1)+(3)(1)(1)+(-1)(3)(0)]-[(1)(8)(-1)+(0)(1)(1)+(1)(3)(3)]}_{-10}$

-10

$\underbrace{[8+3+0]-[-8+0+9]}_{-10} \Rightarrow \frac{11-(1)}{-10}=\frac{10}{-10}=-1$

$z=\begin{bmatrix} 1 & 2 & 3 \\ 3 & -1 & 8 \\ 1 & 1 & 0 \end{bmatrix} \begin{matrix} 1 & 2 \\ 3 & -1 \\ 1 & 1 \end{matrix} \Rightarrow \underbrace{[(1)(-1)(0)+(2)(8)(1)+(3)(3)(1)]-[(1)(-1)(3)+(1)(8)(1)+(0)(3)(2)]}_{-10}$

-10

$\underbrace{[0+16+9]-[-3+8+0]}_{-10} \Rightarrow \frac{25-5}{-10}=\frac{20}{-10}=-2$

$\boxed{(3,-1,-2)}$

College Algebra – Chapter 9
Lesson 7
Determine whether B is the inverse of A.

1. $A = \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}, B = \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix}$

$AB \Rightarrow \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}\begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 1(3)+(2)(-1) & 1(-2)+2(1) \\ 1(3)+3(-1) & 1(-2)+3(1) \end{bmatrix} \Rightarrow$

$\begin{bmatrix} 3-2 & -2+2 \\ 3-3 & -2+3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ✓

$BA \Rightarrow \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix} \Rightarrow \begin{bmatrix} 3(1)+(-2)(1) & 3(2)+(-2)(3) \\ -1(1)+1(1) & -1(2)+1(3) \end{bmatrix} \Rightarrow$

$\begin{bmatrix} 3-2 & 6-6 \\ -1+1 & -2+3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ✓

Yes, they are inverses

2. $A = \begin{bmatrix} 3 & 2 \\ 4 & 3 \end{bmatrix}, B = \begin{bmatrix} 3 & -2 \\ -4 & 3 \end{bmatrix}$

$AB \Rightarrow \begin{bmatrix} 3 & 2 \\ 4 & 3 \end{bmatrix}\begin{bmatrix} 3 & -2 \\ -4 & 3 \end{bmatrix} \Rightarrow \begin{bmatrix} 3(3)+2(-4) & 3(-2)+2(3) \\ 4(3)+3(-4) & 4(-2)+3(3) \end{bmatrix} =$

$\begin{bmatrix} 9-8 & -6+6 \\ 12-12 & -8+9 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ✓

$BA = \begin{bmatrix} 3 & -2 \\ -4 & 3 \end{bmatrix}\begin{bmatrix} 3 & 2 \\ 4 & 3 \end{bmatrix} \Rightarrow \begin{bmatrix} 3(3)+(-2)(4) & 3(2)+(-2)(3) \\ -4(3)+3(4) & -4(2)+3(3) \end{bmatrix}$

$\begin{bmatrix} 9-8 & 6-6 \\ -12+12 & -8+9 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ✓

Yes, they are inverses

3. $A = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 1 & 1 \end{bmatrix}$

$AB \Rightarrow \begin{bmatrix} 1 & 0 & -1 \\ -1 & 1 & 1 \end{bmatrix}\begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 1 & 1 \end{bmatrix} \Rightarrow$

$\begin{bmatrix} 1(2)+(0)(1)+(-1)(1) & 1(1)+(0)(1)+(-1)(1) \\ -1(2)+1(1)+1(1) & -1(1)+1(1)+1(1) \end{bmatrix} \Rightarrow \begin{bmatrix} 2+1-1 & 1+0-1 \\ -2+1+1 & -1+1+1 \end{bmatrix} \Rightarrow$

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ ✓

$BA \Rightarrow \begin{bmatrix} 2 & 1 \\ 1 & 1 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & -1 \\ -1 & 1 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 2(1)+1(-1) & 2(0)+1(1) & 2(-1)+1(1) \\ 1(1)+1(-1) & 1(0)+1(1) & 1(-1)+1(1) \\ 1(1)+1(-1) & 1(0)+1(1) & 1(-1)+1(1) \end{bmatrix} \Rightarrow$

$\begin{bmatrix} 2-1 & 0+1 & -2+1 \\ 1-1 & 0+1 & -1+1 \\ 1-1 & 0+1 & -1+1 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 1 & -1 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ X

Not Inverses

4. $A = \begin{bmatrix} -2 & 1 & 3 \\ 0 & -1 & 1 \\ 1 & 2 & 0 \end{bmatrix}, B = \frac{1}{8}\begin{bmatrix} -2 & 6 & 4 \\ 1 & -3 & 2 \\ 1 & 5 & 2 \end{bmatrix}$

* Work on Back

$B = \begin{bmatrix} -\frac{2}{8} & \frac{6}{8} & \frac{4}{8} \\ \frac{1}{8} & -\frac{3}{8} & \frac{2}{8} \\ \frac{1}{8} & \frac{5}{8} & \frac{2}{8} \end{bmatrix}$

$$AB \Rightarrow \begin{bmatrix} -2 & 1 & 3 \\ 0 & -1 & 1 \\ 1 & 2 & 0 \end{bmatrix} \begin{bmatrix} -\frac{2}{8} & \frac{5}{8} & \frac{4}{8} \\ \frac{1}{8} & -\frac{3}{8} & \frac{2}{8} \\ \frac{1}{8} & \frac{5}{8} & \frac{2}{8} \end{bmatrix}$$

$$\begin{bmatrix} -2(-\frac{2}{8})+1(\frac{1}{8})+3(\frac{1}{8}) & -2(\frac{5}{8})+1(-\frac{3}{8})+3(\frac{5}{8}) & -2(\frac{4}{8})+1(\frac{2}{8})+3(\frac{2}{8}) \\ 0(-\frac{2}{8})+-1(\frac{1}{8})+1(\frac{1}{8}) & 0(\frac{5}{8})+-1(-\frac{3}{8})+1(\frac{5}{8}) & 0(\frac{4}{8})+-1(\frac{2}{8})+1(\frac{2}{8}) \\ 1(-\frac{2}{8})+2(\frac{1}{8})+0(\frac{1}{8}) & 1(\frac{5}{8})+2(-\frac{3}{8})+0(\frac{5}{8}) & 1(\frac{4}{8})+2(\frac{2}{8})+0(\frac{2}{8}) \end{bmatrix}$$

$$\begin{bmatrix} \frac{4}{8}+\frac{1}{8}+\frac{3}{8} & -\frac{12}{8}-\frac{3}{8}+\frac{15}{8} & -\frac{8}{8}+\frac{2}{8}+\frac{6}{8} \\ 0-\frac{1}{8}+\frac{1}{8} & 0+\frac{3}{8}+\frac{5}{8} & 0-\frac{2}{8}+\frac{2}{8} \\ -\frac{2}{8}+\frac{2}{8}+0 & \frac{5}{8}-\frac{5}{8}+0 & \frac{4}{8}+\frac{4}{8}+0 \end{bmatrix} \Rightarrow \begin{bmatrix} \frac{8}{8} & \frac{0}{8} & \frac{0}{8} \\ \frac{0}{8} & \frac{8}{8} & \frac{0}{8} \\ \frac{0}{8} & \frac{0}{8} & \frac{8}{8} \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \checkmark$$

$$BA \Rightarrow \begin{bmatrix} -\frac{2}{8} & \frac{5}{8} & \frac{4}{8} \\ \frac{1}{8} & -\frac{3}{8} & \frac{2}{8} \\ \frac{1}{8} & \frac{5}{8} & \frac{2}{8} \end{bmatrix} \begin{bmatrix} -2 & 1 & 3 \\ 0 & -1 & 1 \\ 1 & 2 & 0 \end{bmatrix}$$

$$\begin{bmatrix} -\frac{2}{8}(-2)+\frac{5}{8}(0)+\frac{4}{8}(1) & -\frac{2}{8}(1)+\frac{5}{8}(-1)+\frac{4}{8}(2) & -\frac{2}{8}(3)+\frac{5}{8}(1)+\frac{4}{8}(0) \\ \frac{1}{8}(-2)+-\frac{3}{8}(0)+\frac{2}{8}(1) & \frac{1}{8}(1)+-\frac{3}{8}(-1)+\frac{2}{8}(2) & \frac{1}{8}(3)+-\frac{3}{8}(1)+\frac{2}{8}(0) \\ \frac{1}{8}(-2)+\frac{5}{8}(0)+\frac{2}{8}(1) & \frac{1}{8}(1)+\frac{5}{8}(-1)+\frac{2}{8}(2) & \frac{1}{8}(3)+\frac{5}{8}(1)+\frac{2}{8}(0) \end{bmatrix}$$

$$\begin{bmatrix} \frac{4}{8}+0+\frac{4}{8} & -\frac{12}{8}-\frac{5}{8}+\frac{8}{8} & -\frac{24}{8}+\frac{5}{8}+0 \\ -\frac{2}{8}+0+\frac{2}{8} & \frac{1}{8}+\frac{3}{8}+\frac{4}{8} & \frac{3}{8}-\frac{3}{8}+0 \\ -\frac{2}{8}+0+\frac{2}{8} & \frac{1}{8}-\frac{5}{8}+\frac{4}{8} & \frac{3}{8}+\frac{5}{8}+0 \end{bmatrix} \Rightarrow \begin{bmatrix} \frac{8}{8} & \frac{0}{8} & \frac{0}{8} \\ \frac{0}{8} & \frac{8}{8} & \frac{0}{8} \\ \frac{0}{8} & \frac{0}{8} & \frac{8}{8} \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \checkmark$$

College Algebra – Chapter 9
Lesson 7
Find A^{-1}, if it exists.

5. $A = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$

$\det \Rightarrow 2(3) - (1)(0) = 6 - 0 = 6$

$A^{-1} \Rightarrow \frac{1}{6}\begin{bmatrix} 3 & 0 \\ -1 & 2 \end{bmatrix} \Rightarrow \begin{bmatrix} \frac{1}{2} & 0 \\ -\frac{1}{6} & \frac{1}{3} \end{bmatrix}$

6 $A = \begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix}$

$\det \Rightarrow (2)(6) - (3)(4) \Rightarrow 12 - 12 = 0$

Inverse does not exist.

7. $A = \begin{bmatrix} 4 & 3 \\ 1 & 0 \end{bmatrix}$

$\det \Rightarrow (4)(0) - 1(3) = 0 - 3 = -3$

$A^{-1} \Rightarrow -\frac{1}{3}\begin{bmatrix} 0 & -3 \\ -1 & 4 \end{bmatrix} \Rightarrow \begin{bmatrix} 0 & 1 \\ \frac{1}{3} & -\frac{4}{3} \end{bmatrix}$

College Algebra – Chapter 9
Lesson 8, Day 1

Write each matrix equation as a linear system of equations.

1. $\begin{bmatrix}1 & -2\\ 2 & 2\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}0\\ 5\end{bmatrix}$

$x-2y=0$
$2x+2y=5$

2. $\begin{bmatrix}2 & 3\\ 3 & -1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}0\\ 11\end{bmatrix}$

$2x+3y=0$
$3x-y=11$

3. $\begin{bmatrix}2 & 3 & 1\\ 5 & 7 & -1\\ 4 & 3 & 0\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}-1\\ 5\\ 5\end{bmatrix}$

$2x+3y+z=-1$
$5x+7y-z=5$
$4x+3y=5$

4. $\begin{bmatrix}3 & -2 & 3\\ 5 & 0 & 4\\ 2 & 7 & 0\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}4\\ 3\\ -8\end{bmatrix}$

$3x-2y+3z=4$
$5x+4z=3$
$2x+7y=-8$

Solve each system by using inverse matrices.

5. $3x + 7y = 11$
$-5x + 4y = 13$

$\begin{bmatrix}3 & 7\\ -5 & 4\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}11\\ 13\end{bmatrix}$

$\det A \Rightarrow (3)(4)-(-5)(7) \Rightarrow 12+35=47$

$A^{-1}=\frac{1}{47}\begin{bmatrix}4 & -7\\ 5 & 3\end{bmatrix}\Rightarrow\begin{bmatrix}4/47 & -7/47\\ 5/47 & 3/47\end{bmatrix}$

$\begin{bmatrix}4/47 & -7/47\\ 5/47 & 3/47\end{bmatrix}\begin{bmatrix}11\\ 13\end{bmatrix}\Rightarrow\begin{bmatrix}\frac{4}{47}(11)+\frac{-7}{47}(13)\\ \frac{5}{47}(11)+\frac{3}{47}(13)\end{bmatrix}\Rightarrow$

$\begin{bmatrix}\frac{44}{47}-\frac{91}{47}\\ \frac{55}{47}+\frac{39}{47}\end{bmatrix}\Rightarrow\begin{bmatrix}-\frac{47}{47}\\ \frac{94}{47}\end{bmatrix}\Rightarrow\begin{bmatrix}-1\\ 2\end{bmatrix}$

$(-1, 2)$

6. $x - 7y = 3$
$2x + 3y = 23$

$\begin{bmatrix}1 & -7\\ 2 & 3\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}3\\ 23\end{bmatrix}$

$\det A \Rightarrow (1)(3)-(2)(-7) \Rightarrow 3+14=17$

$A^{-1}\Rightarrow\frac{1}{17}\begin{bmatrix}3 & 7\\ -2 & 1\end{bmatrix}\Rightarrow\begin{bmatrix}3/17 & 7/17\\ -2/17 & 1/17\end{bmatrix}$

$\begin{bmatrix}3/17 & 7/17\\ -2/17 & 1/17\end{bmatrix}\begin{bmatrix}3\\ 23\end{bmatrix}\Rightarrow\begin{bmatrix}\frac{3}{17}(3)+\frac{7}{17}(23)\\ -\frac{2}{17}(3)+\frac{1}{17}(23)\end{bmatrix}\Rightarrow$

$\begin{bmatrix}\frac{9}{17}+\frac{161}{17}\\ -\frac{6}{17}+\frac{23}{17}\end{bmatrix}\Rightarrow\begin{bmatrix}\frac{170}{17}\\ \frac{17}{17}\end{bmatrix}\Rightarrow\begin{bmatrix}10\\ 1\end{bmatrix}$

$(10, 1)$