

College Algebra Math Journal Topics

Each unit has a set number of required topics that must be answered, following the requirements on the Math Journal Rubric. The rubric has a 4 point system, 0, 1, 2, and 3. You must maintain an 80% average, or 2.4 points. If this requirement is not met, you will need to revise a response and resubmit your journal. Questions must meet rubric requirements as well.

Unit 1: Linear, Quadratic and Polynomial Relationships

(Up to 3 can be questions)

- Chapter 1: Lines and Parabolas (Choose 2)
 - Give two real-life quantities that have (a) a positive correlation, (b) a negative correlation, and (c) approximately no correlation.
 - Explain how to determine whether a quadratic function will have a minimum value or a maximum value.
 - A quadratic function is increasing to the left of $x=2$ and decreasing to the right of $x=2$. Will the vertex be the highest or lowest point on the graph of the parabola?
 - The point $(1, 5)$ lies on the graph of a quadratic function with axis of symmetry $x = -1$. Your friend says the vertex could be the point $(0, 5)$. Is your friend correct?
 - Explain when to use intercept form and when to use vertex form when writing an equation of a parabola.
 - You use a system with three variables to find the equation of a parabola that passes through the points $(-8, 0)$, $(2, -20)$, and $(1, 0)$. Your friend uses intercept form to find the equation. Whose method is easier?

- Chapter 2: Quadratic Equations and Complex Numbers (Choose 2)
 - Compare factoring $6x^2 - x - 2$ with factoring $x^2 - x - 2$.
 - What does it mean for a polynomial to be factored completely?
 - Explain how to use graphing to find the roots of the equation $ax^2 + bx + c = 0$.
 - Describe how to add complex numbers.
 - Can you solve an equation by completing the square when the equation has two imaginary solutions?
 - Your friend says the equation $x^2 + 10x = -20$ can be solved by either completing the square or factoring. Is your friend correct?
 - Describe the different types of solutions you can have based on the discriminant.

- Which two methods can you use to solve any quadratic equation? Explain when you might prefer to use one method over the other.
 - Describe the possible solutions of a system consisting of two quadratic equations.
- Chapter 3: Polynomial Operations (Choose 2)
- Explain how to solve $x^2 + 6x - 8 < 0$ using algebraic methods and using graphs.
 - Explain what is meant by the end behavior of a polynomial function.
 - Describe three different methods to expand $(x + 3)^3$.
 - Your friend claims the sum of two binomials is always a binomial and the product of two binomials is always a trinomial. Is your friend correct?
 - Explain the Remainder Theorem in your own words. Use an example in your explanation.
 - How do you know when a polynomial is factored completely?
 - Explain the Factor Theorem and why it is useful.
- Chapter 4: Solving Polynomial Functions (Choose 2)
- Your friend claims that when a polynomial function has a leading coefficient of 1 and the coefficients are all integers, every possible rational zero is an integer. Is your friend correct?
 - How many solutions does the polynomial equation $(x + 8)^3(x - 1) = 0$ have?
 - Write a polynomial function of degree 6, with zeros 1, 2, and $-i$. Justify your answer.
 - The graph of the constant polynomial function $f(x) = 2$ is a line that does not have any x -intercepts. Does the function contradict the Fundamental Theorem of Algebra?
 - Explain what a local maximum of a function is and how it may be different from the maximum value of the function.
 - Explain how you know when a set of data could be modeled by a cubic function.
 - Explain why you cannot always use finite differences to find a model for real-life data sets.

Unit 2: Radical, Rational, Exponential, and Logarithmic Functions

(Up to 2 can be questions)

- Chapter 5: Radical and Rational Functions (Choose 2)
- Explain how to use the sign of a to determine the number of real fourth roots of a and the number of real fifth roots of a .
 - How do you know when a radical expression is in simplest form?
 - Your friend claims it is not possible to simplify the expression $7\sqrt{11} - 9\sqrt{44}$ because it does not contain like radicals. Is your friend correct?
 - Explain the steps you should use to solve $\sqrt{x} + 10 < 15$.
 - Your friend says it is impossible for a radical equation to have two extraneous solutions. Is your friend correct?

- What x-values are not included in the domain of the quotient of two functions?
- Explain how to determine whether the inverse of a function is also a function.
- Chapter 6: Exponential and Logarithmic Functions (Choose 2)
 - Tell whether the function $f(x) = 1/3e^{4x}$ represents exponential growth or decay.
 - Can the natural base e be written as a ratio of two integers?
 - Describe the relationship between $y = 7^x$ and $y = \log_7 x$.
 - Your friend claims you can use the change-of-base formula to graph $y = \log_3 x$ using a graphing calculator. Is your friend correct?
 - Compare the methods for solving exponential and logarithmic equations.
 - When do logarithmic equations have extraneous solutions?
- Chapter 7: Rational Functions (Choose 2)
 - Describe a real life situation that can be modeled by an inverse variation.
 - Suppose x varies inversely with y and y varies inversely with z . How does x vary with z ? Justify your answer.
 - Your friend claims that it is possible for a rational function to have two vertical asymptotes. Is your friend correct?
 - Describe how to multiply and divide two rational equations.
 - Explain how adding and subtracting two rational functions is similar to adding and subtracting numerical fractions.
 - Your friend claims that the least common multiple of two numbers is always greater than each of the numbers. Is your friend correct?
 - When can you solve a rational equation by cross multiplying? When can't you?

Unit 3: Transformations, Systems of Equations and Matrices

(Up to 2 can be questions)

- Chapter 8: Transformations (Choose 2)
 - Your friend says two different translations of the graph of the parent linear function can result in the graph of $f(x) = x - 2$. Is your friend correct?
 - Your friend claims that when writing a function whose graph represents a combination of transformations, the order is not important. If your friend correct?
 - Given the function $f(x) = ab^{x-h} + k$, describe the effects of a , h , and k on the graph of the function.
 - Is it possible to transform the graph of $f(x) = e^x$ to obtain the graph of $g(x) = \ln x$?

- Chapter 9: Systems of Equations and Matrices (Choose 2)
 - Explain how you know when a linear system in three variables has infinitely many solutions.
 - A linear system in three variables has no solution. Your friend concludes that it is not possible for two of the three equations to have any points in common. Is your friend correct?
 - Explain when it might be more convenient to use the elimination method than the substitution method to solve a linear system. Give an example to support your claim.
 - Compare solving systems algebraically and by using matrices. Which do you prefer?
 - How are matrix operations similar to arithmetic operations? How are they different?

Unit 3: Conic Sections, Sequences and Series

(Up to 2 can be questions)

- Chapter 10: Conic Sections (Choose 1)
 - Explain how to find the coordinates of the focus of a parabola with vertex $(0, 0)$ and directrix $y = 5$.
 - Is a parabola always the graph of a function? Why or why not?
 - Describe a real world application that would include using conic sections.
- Chapter 11: Sequences and Series (Choose 2)
 - Explain how to find the coordinates of the focus of a parabola with vertex $(0, 0)$ and directrix $y = 5$.
 - Compare sequences and series.
 - How can you determine whether a sequence is geometric from its graph?
 - Explain the difference between an explicit rule and a recursive rule for a sequence.