

1. Let $f(x) = 6x^3 + 7x^2 - x - 2$. Use the fact that $f(-1) = 0$ to factor f completely.
2. Find x if $\log_2 x = -5$.
3. Find the vertex of the parabola given by $f(x) = 2x^2 + 3x - 4$. (Give the x and y -coordinates.) Graph $f(x)$.
4. Expand $(2x + y)^4$ with terms ordered from greatest to least powers of x .
5. Expand $(3x - 2y)^3$ with terms ordered from greatest to least powers of x .
6. Let $a_3 = \frac{1}{3}$ and $a_7 = \frac{625}{3}$ be terms of a geometric sequence. Find S_5 , the sum of the first 5 terms of the sequence.

7. Find the inverse of

$$f(x) = \frac{2x + 5}{3x - 1}.$$

8. A firm's profit function is given by

$$f(x) = 102x - x^2 - 200.$$

where x represents the number of units sold.

- (1) For which values of x will the firm break even?
 - (2) Over what range of number of units sold will the firm make a profit?
9. Let $f(x) = x - 95 - \frac{450}{x - 10}$. Find the roots of f .
 10. Let $f(x) = \sqrt{x^2 - 6}$. Find the domain of f .
 11. Let $g(x) = \sqrt{x - 7} + 2$. What is the basic function type? Find a series of geometric transformations to construct $g(x)$ from the basic function. Check your work by applying these transformations to the basic function.
 12. Graph $f(x) = 3(x - 2)^2 + 4$.
 13. Graph $|x|$.
 14. Graph x^3 .
 15. Graph \sqrt{x} .
 16. Graph $\frac{1}{x}$.
 17. Graph $3x + 2y = 7$.
 18. Graph $5x - 3y = 4$.
 19. Find a line perpendicular to $7x + 4y = 3$ with the same y -intercept.
 20. Find a line perpendicular to $3x - y = 11$ passing through $(2, 1)$.
 21. Find a line parallel to $y - 5x = 6$ that passes through $(-1, 1)$.
 22. Find a line with x -intercept 6 and slope 5.
 23. Find the slope and y -intercept of $3y - 7x = 30$.
 24. Find a line passing through the points $(2, 1)$ and $(0, 3)$.
 25. Find a polynomial with roots $3/2$, -2 and 1 and y -intercept 5.
 26. Find the horizontal and vertical asymptotes of $\frac{2x^2 + 3x - 2}{3x^2 + x - 6}$.

27. Five hundred dollars are placed in an account that collects interest at a yearly rate of 5% compounded quarterly.

- (1) How much money is in the account after 3 years? Give an exact expression for your answers in terms of an exponential.
- (2) How much time must pass before the balance is \$3000? Give an exact expression for your answer in terms of logarithms.

28. Find the determinant of

$$\begin{bmatrix} 2 & 3 & -2 \\ -1 & 7 & 0 \\ 2 & 1 & 4 \end{bmatrix}.$$

29. Solve the following system:

$$2x + 3y - 7z = 20.$$

$$x - y + z = -2.$$

$$x - 2z = 4.$$

30. Write the parabola $y = 3x^2 + 6x - 7$ in standard form, i.e. in the form $y = a(x - h)^2 + k$.

31. Find the equation for a parabola with vertex $(3/2, 2)$ and y -intercept 4.

32. Let $f(x) = x^2 - 3$ and $g(x) = 3x + 1$. Find $(f \circ g)(x)$ and $(g \circ f)(x)$.

33. Find all the roots of $2x^3 + 5x^2 - 28x - 15$. *Hint: you should initially use the rational root theorem to find one root. This will allow you to reduce to a quadratic polynomial.*

34. Find the midpoint of the line segment connecting $(3, 2)$ and $(7, 11)$.

35. $(x - 7)^2 + (y + 2)^2 - 16 = 9$. Find the center of this circle. Find the diameter.

36. Write down the equation of a circle with midpoint $(5, 2)$ and radius 7.

37. Expand

$$\log \left(\frac{\sqrt{3x+2}}{x^2y} \right).$$

38. Combine $\ln y - 2 \ln z + \frac{2}{3} \ln x$ into a single logarithm.

39. Solve

$$\ln(x - 3) + \ln(x - 6) = \ln 4.$$

Check for extraneous solutions.

40. Solve $e^{2x} - e^x = 56$. Check for extraneous solutions.

41. Solve

$$e^{x^2-x} = e^{x+3}.$$

42. Does the equation $y^2 - x = 2$ represent y as a function of x ? Explain your answer.

43. The population P (in millions) of certain country is given by $P = 3e^{-t/60}$, where t is time in years.

- (1) According to the model, is the population going up or down? Explain.
- (2) Find an expression for the time when the population will be 2 million.

44. Find the domain of $\ln(x^3 - 2)$.

45. If $e^{3x} = 5$, solve for x .

46. Condense the expression to a single logarithmic expression:

$$\log(x - 3) + \log(2x + 3) + \log(2 - 3x).$$

47. Find the distance between $(2, 3)$ and $(-3, 2)$.

48. The cost per unit function for a manufacturing process is given by $f(x) = 3x^2 - 48x + 11$, where x represents the units produced. For what rate of production is the cost per unit minimized? What is the cost per unit at this rate?

49. Evaluate $f(x) = 3x^4 + 2x^3 - x^2 + 7x + 6$ at $x = -2$ by synthetic division.

50. Write $\frac{2 + 3i}{1 - 2i}$ in standard form. That is, write it in the form $a + bi$.

51. Find the absolute value of $3 - 2i$.

52. Use the quadratic formula to find the roots of $3x^2 + x + 2$. Simplify as much as possible. Replace the square root of negative one with i .

53. Suppose that \$500 is put in a CD with 7% yearly interest rate compounded three times per year.

(1) How much money is in the CD after 8 years?

(2) How much time must pass before the balance grows to \$900? Give an exact expression by using logarithms.

54. List all the possible rational roots of $7x^6 - 3x^4 + 12x^3 - 4x + 11$.

55. Graph the function 2^x . Label at least three points on your graph.

56. Rewrite $\log_2 3$ in terms of the natural logarithm and the logarithm with base 10.

57. Solve the equation $3 \cdot 2^{3x-2} - 4 = 3$ by using logarithms.

58. Suppose that $a_4 = 7$ and $a_{10} = 25$ are terms of an arithmetic sequence. Find S_{50} , the sum of the first fifty terms.

59. Let $a_3 = 12$ and $a_5 = 3$ be terms of a geometric sequence. Find the infinite sum of the sequence.

60. Compute $\binom{10}{7}$.