

Instructions: Please use the problems below to prepare for the College Algebra Final Exam.

Solve the problem.

- 1) A toy company uses the linear model $y = -3x + 571$ to predict the decline in sales of a toy after it has been on the market more than one year. If x is the number of months after the first year and y is the number of toys sold in hundreds during that month, how many toys will be sold 13 months after the first year?
- 2) Your home state uses a linear model $y = 22(x - 70) + 4338$ to predict the number of vacationers (y) as compared to the average temperature for that week (x). Find the number of vacationers for a week with an average temperature of 68 degrees.

Find the quotient. Write the answer in standard form.

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

4) $\frac{4+3i}{5+3i}$

Solve the equation.

5) $\frac{2x+5}{2} - \frac{3x}{x-2} = x$

6) $\frac{4x+1}{x-2} + \frac{2}{x} = \frac{-4}{x^2-2x}$

7) $\sqrt{x+3} = x - 3$

8) $\sqrt{x+7} + 5 = x$

Solve the equation

9) $(x+3)^{1/3} = -2$

10) $(x + 7)^{3/2} = 8$

Find the center-radius form of the equation of the circle described.

11) Center $(-5, 4)$, radius 2

Decide whether or not the equation has a circle as a graph. If it does, give the center and radius.

12) $x^2 + y^2 + 8x + 4y + 11 = 0$

Find the equation of the line passing through the given points. Write your answer in slope-intercept form.

13) Passing through $(5, 5)$ and $(8, 4)$

14) Passing through $(-8, -3)$ and $(-5, -8)$

Find the requested value.

15) $f(-4)$ for $f(x) = \begin{cases} 2x, & \text{if } x \leq -1 \\ x - 2, & \text{if } x > -1 \end{cases}$

16) $f(7)$ for $f(x) = \begin{cases} 2x + 1, & \text{if } x < 1 \\ 7x, & \text{if } 7 \leq x \leq 9 \\ 7 - 9x, & \text{if } x > 9 \end{cases}$

Describe how the graph of the equation relates to the graph of $y = x^2$.

17) $y = -(x + 9)^2$

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

For the given functions f and g , find the indicated composition.

19) Find $(f \circ g)(x)$ if $f(x) = 7x + 14$ and $g(x) = 4x - 1$

20) Find $(g \circ f)(x)$ if $f(x) = -4x + 9$ and $g(x) = 2x + 7$

Solve the problem.

21) If an object is propelled upward from a height of 144 feet at an initial velocity of 128 feet per second, then its height after t seconds is given by the equation $h(t) = -16t^2 + 128t + 144$. After how many seconds does the object hit the ground?

22) John owns a hotdog stand. He has found that his profit is represented by the equation $P(x) = -x^2 + 60x + 71$, with P being profits and x the number of hotdogs sold. How many hotdogs must he sell to earn the most profit?

Determine the remainder in the following division.

23) $(2x^3 - 5x^2 - 4x + 17) \div (x + 3)$

24) $(6x^4 + 10x^3 + 2x^2 - 6x + 35) \div (x + 3)$

Find all rational zeros.

25) $f(x) = x^3 + 6x^2 - 9x - 54$

26) $f(x) = x^3 - 6x^2 + 3x + 10$

Find the correct end behavior diagram for the given polynomial function.

27) $P(x) = 6x^3 + 3x^2 - 3x + 8$

28) $P(x) = 4 - 4x + x^2 - x^3 - 4x^4$

Find the equation for the inverse of the following functions.

29) $f(x) = 7x - 4$

30) $f(x) = x^3 - 1$

Solve the equation.

31) $3^{2x-7} = 81$

32) $9^{3x-3} = 81^{x+4}$

Solve the problem.

33) Suppose that \$5000 is invested at an interest rate of 9% compounded continuously. What is the balance after 6 years?

34) An initial investment of \$1240 is appreciated for 17 years in an account that earns 8% interest, compounded continuously. Find the amount of money in the account at the end of the period.

Use the change of base rule to find the logarithm to four decimal places.

35) $\log_7 24.10$

36) $\log_9 0.707$

Write the expression as a sum, difference, and/or product of logarithms (expand).

37) $\log_b \left(\frac{xy^6}{z^3} \right)$

38) $\log_5 \left(\frac{\sqrt[7]{m} \sqrt[6]{n}}{k^2} \right)$

Solve the equation for x .

39) $\log_6(x - 3) = 2$

40) $\log_5(x - 1) = -2$

41) The growth in population of a city can be seen using the formula $P(t) = 7858e^{0.002t}$, where t is the number of years since 1970. According to this formula, in how many years will the population reach 11,787? (to the nearest tenth of a year)

Find the indicated matrix (perform the indicated operation).

42) Let $A = \begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -1 & 6 \end{bmatrix}$. Find $4A + B$.

43) Let $A = \begin{bmatrix} 3 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 \\ -1 & 6 \end{bmatrix}$. Find $3A + B$.

Find the value of the determinant.

44) $\begin{vmatrix} -5 & -2 \\ 8 & -3 \end{vmatrix}$

45) $\begin{vmatrix} 5 & 1 & 9 \\ 8 & -3 & 6 \\ 8 & -3 & -4 \end{vmatrix}$

Solve the equation for x .

46) $x^2 - 10x + 41 = 0$

$$47) x^2 - 8x + 52 = 0$$

Solve the system.

$$\begin{array}{l} 2x + 4y + z = 6 \\ 48) \quad 5x - 3y - z = -30 \\ \quad 5x + y + 5z = -26 \end{array}$$

$$\begin{array}{l} x + y + z = -2 \\ 49) \quad x - y + 2z = 2 \\ \quad 4x + y + z = -11 \end{array}$$

Final Exam Answer Key Review

1) 53,200 tons

2) 4294 Vac.

3) $\frac{2}{13} + \frac{10}{13}i$

4) $\frac{29}{34} + \frac{3i}{34}$

5) -10

6) $\{-3/4\}$

7) $\{6\}$

8) $\{9\}$

9) $\{-11\}$

10) $\{-3\}$

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

12) $C(-4, -2); r=3$

13) $y = -\frac{1}{3}x + \frac{20}{3}$

14) $y = -\frac{5}{3}x - \frac{79}{3}$

15) -8

16) 49

17) 9 units left, reflection across x-axis

18) 8 units right, 5 units up

19) $28x + 7$

20) $-8x + 25$

21) 9

22) 30 hot dogs

23) -70

24) 287

25) $-2, -5, 1$

26) $2, 5, -1$

27) Falls to the left, rises to the right

28) Falls to the left, falls to the right

29) $f^{-1}(x) = \frac{x+4}{7}$

30) $F^{-1}(x) = \sqrt[3]{x+1}$

31) $\frac{11}{2}$

32) 11

33) \$ 8,580.03

34) \$ 4831.28

35) 1.6353

36) -0.1578

37) $\log_b x + 6 \log_a y - 3 \log_3 z$

38) $\frac{1}{7} \log_5 m + \frac{1}{6} \log_5 n - 2 \log_5 k$

39) 2393

$$40) \sqrt{\frac{240}{25}} y$$

$$41) 202.7 \text{ yrs}$$

$$42) \begin{bmatrix} 4 & 16 \\ 7 & 26 \end{bmatrix}$$

$$43) \begin{bmatrix} 9 & 13 \\ 5 & 18 \end{bmatrix}$$

$$44) 31$$

$$45) 230$$

$$46) \sqrt{5 \pm 4i} y$$

$$47) \sqrt{4 \pm 6i} y$$

$$48) (-4, 4, -2)$$

$$49) (-3, -1, 2)$$

