

1. Simplify the complex fraction $\frac{\frac{3}{x} + \frac{3}{y}}{\frac{4}{y^2} - \frac{4}{x}}$.

- A) $\frac{3y(x+y)}{4(x+y^2)}$ B) $\frac{3(x+y)}{4(x-y^2)}$ C) $\frac{3(x-y)}{4(x+y)}$ D) $\frac{3y(x+y)}{4(x-y^2)}$ E) $\frac{3y(x-y)}{4(x+y)}$

2. A rectangular frame for a painting has a perimeter of 82 inches. If the length of the frame is 25 inches, find the width of the frame.

- A) 18 in. B) 57 in. C) 16 in. D) 41 in. E) 66 in.

3. Compute a zero of the quadratic function $f(x) = 23x^2 + 576$.

- A) $x = \frac{24}{23}i$ B) $x = \frac{24\sqrt{23}}{23}$ C) $x = \frac{-24\sqrt{23}}{23}$ D) $x = \frac{24}{23}$ E) $x = \frac{-24\sqrt{23}}{23}i$

4. Coordinates of the vertex for the parabola $y = x^2 + 12x + 40$ are:

- A) (6, 4) B) (-6, 4) C) (-4, 6) D) (4, 6) E) (0, 4)

5. Solve: $3(x-10) > 3x - 27$

- A) $0 > 3$ B) $-3 < x < 10$ C) $x \leq -20$ D) $x < -10$ E) no solution

6. Solve the radical equation $\sqrt{x^2+1} = \sqrt{10}$ to find all real solutions.

- A) $x = -9; x = 9$ B) $x = 11$ C) $x = 9$ D) $x = 3$ E) $x = -3; x = 3$

7. Write the slope-intercept form of the equation of the line through the given point parallel to the given line.

point: (4, 6) line: $-40x - 8y = -4$

- A) $y = \frac{1}{40}x + \frac{59}{10}$ B) $y = \frac{1}{5}x$ C) $y = -40x - 15$ D) $y = -5x + 26$ E) $y = -5x$

8. Find the remainder of $p(x) \div q(x)$. Here, $p(x) = x^3 - x + 9$ and $q(x) = x - 2$.

- A) -15 B) 15 C) 3 D) 0 E) -3

9. Evaluate $f(-x)$ for the following function. $f(x) = 6x^2$

- A) $6x^4$ B) $-6x^3$ C) $6x^3$ D) $-6x^2$ E) $6x^2$

10. Write the slope-intercept form of the equation of the line through the given point perpendicular to the given line.

point: (4, 9) line: $9x + 45y = 8$

- A) $y = \frac{1}{9}x + \frac{85}{9}$ B) $y = \frac{1}{5}x + \frac{49}{5}$ C) $y = 5x - 11$ D) $y = 9x + 45$ E) $y = 5x$

11. Given that $f(x) = \sqrt[3]{x-1}$ and $g(x) = x^3 + 1$ determine the value of $(f \circ g)(0)$ (if possible).

- A) 0 B) 2 C) 1 D) $x^3 - 1$ E) not possible

12. The volume of a gas varies directly with the temperature. If the volume is 30cc at 40°C , what is the volume if the temperature is 64°C ?

- A) 48 cc B) 64 cc C) $\frac{256}{3}$ cc D) $\frac{64}{3}$ cc E) $\frac{3}{256}$ cc

13. Use the zero $x = -\frac{1}{5}$ to completely factor the polynomial $f(x) = 5x^3 + x^2 + 35x + 7$.

- A) $(5x+1)(x^2+7)$ B) $(5x-1)(x^2+7)$ C) $(5x+1)(x^2-7)$
D) $(7x+1)(x^2+5)$ E) $(7x-1)(x^2+5)$

14. Solve the system of equations.
$$\begin{cases} -8x + 5y = 6 \\ -16x + 10y = 2 \end{cases}$$

- A) $\left(-\frac{7}{16}, \frac{7}{10}\right)$ B) $\left(\frac{1}{2}, \frac{5}{16}\right)$ C) $\left(\frac{5}{16}, \frac{1}{2}\right)$ D) $\left(\frac{7}{16}, -\frac{7}{10}\right)$ E) no

solution

15. Solve the inequality $x^2 - 10 \geq x$.

- A) $\left(-\infty, \frac{1}{2} - \frac{\sqrt{41}}{2}\right] \cup \left[\frac{1}{2} + \frac{\sqrt{41}}{2}, \infty\right)$ B) $\left(-\infty, \frac{1}{3} - \frac{\sqrt{41}}{3}\right) \cup \left(\frac{1}{3} + \frac{\sqrt{41}}{3}, \infty\right)$
C) $\left(-\infty, -\frac{1}{2} - \frac{\sqrt{41}}{2}\right) \cup \left(\frac{1}{2} + \frac{\sqrt{41}}{2}, \infty\right)$ D) $\left(-\infty, \frac{1}{2} + \frac{\sqrt{41}}{2}\right]$ E) $\left[\frac{1}{3} - \frac{\sqrt{41}}{3}, \infty\right)$

16. Write the standard form of the equation of the circle with radius $r = 8$ and center: $(5, -2)$.
- A) $(x-5)^2 + (y-2)^2 = 64$ B) $(x+5)^2 + (y+2)^2 = 64$ C) $(x-5) + (y+2) = 8$
D) $(x-5)^2 + (y+2)^2 = 64$ E) $(x+5)^2 + (y-2)^2 = 8$
17. One of the zeros of a certain quadratic polynomial with real coefficients is $10 + i$. What is its other zero?
- A) $10 - i$ B) $\frac{1}{10 - i}$ C) $\frac{1}{10 + i}$ D) $-10 - i$ E) $\frac{1}{-10 - i}$
18. The population P (in thousands) of a city from 1990 to 2004 can be modeled by $P = 367.55e^{-0.01052t}$, where t is the year, with $t = 0$ corresponding to 1990. According to the model, during what year will the population be approximately 275,000?
- A) 2003 B) 2045 C) 2017 D) 1999 E) 1996
19. Expand the expression $\log \frac{x^2}{\sqrt[3]{y}}$ as a sum, difference, and/or constant multiple of logarithms.
- A) $\frac{2}{3}(\log x - \log y)$ B) $2 \log x - 3 \log y$ C) $\log 2x - \log \frac{y}{3}$ D) $2 \log x - \frac{1}{3} \log y$
E) $\log \frac{x^2}{\sqrt[3]{y}}$
20. Solve using any method.
- $$\begin{cases} 6x + 3y = -10 \\ y = x - 4 \end{cases}$$
- A) $(2, -2)$ B) $\left(-7, \frac{11}{6}\right)$ C) $\left(-\frac{22}{9}, -\frac{14}{9}\right)$ D) $\left(\frac{2}{9}, -\frac{34}{9}\right)$ E) inconsistent
21. Find the determinant of the matrix $\begin{bmatrix} 5 & -8 \\ -7 & 9 \end{bmatrix}$.
- A) -11 B) 37 C) -32 D) 23 E) -101
22. Find the fifth term of the sequence. (Assume that n begins with 1.) $a_n = -2n + 2$
- A) -12 B) -6 C) -10 D) -8 E) 8

23. The volume of a small drum in the shape of a right circular cylinder is 224π cubic feet. The radius of the drum is 8 feet. Find the height of the drum.

- A) 3.5 ft B) 4.5 ft C) 4.0 ft D) 5.5 ft E) 5.0 ft

24. An open box is to be made from a square piece of cardboard, 24 inches on a side, by cutting equal squares with sides of length x from the corners and turning up the sides. Determine the function, V , in terms of x , that represents the volume of the box.

- A) $V(x) = -2x^3 + 24x^2$ B) $V(x) = -4x^3 + 48x^2$ C) $V(x) = 4x^3 - 48x^2 + 24x$
 D) $V(x) = -4x^3 + 48x^2 - 24x$ E) $V(x) = 4x^3 - 96x^2 + 576x$

25. Solve the system of equations $\begin{cases} \frac{x+1}{4} + \frac{y-1}{2} = -\frac{1}{2} \\ 2x + y = 10 \end{cases}$.

- A) $x = 7, y = -4$ B) $x = 4, y = -7$ C) $x = -7, y = 4$ D) $x = 8, y = -5$
 E) $x = 5, y = -8$

26. If possible, find AB . $A = \begin{bmatrix} -1 \\ -3 \end{bmatrix}, B = \begin{bmatrix} 4 & 7 \\ 0 & 3 \\ 1 & 6 \end{bmatrix}$

- A) $\begin{bmatrix} 17 & 9 & 17 \end{bmatrix}$ B) $\begin{bmatrix} 17 \\ 9 \\ 17 \end{bmatrix}$ C) $\begin{bmatrix} -4 & -21 \\ 0 & -9 \\ -1 & -18 \end{bmatrix}$ D) $\begin{bmatrix} -25 \\ -9 \\ -19 \end{bmatrix}$ E) not possible

27. Use the quadratic formula to solve $x^2 - 18x + 250 = 0$.

- A) $x = -88 \pm 13i$ B) $x = -4 \pm 13i$ C) $x = 4 \pm 13i$ D) $x = -9 \pm 13i$
 E) $x = 9 \pm 13i$

28. Solve the logarithmic equation $\ln(5x+1) = 5$

- A) $\frac{e^5 - 1}{5}$ B) $\frac{e^5 + 1}{5}$ C) $\frac{e^{-5} - 1}{5}$ D) $\frac{e^{-5} + 1}{5}$ E) $5e^{-5} - 5$

29. Solve the exponential equation below algebraically. Round your result to three decimal places.

$$1100e^{3x} = 55$$

- A) -3.903 B) -0.999 C) -2.607 D) 1.731 E) 0.540

30. Determine the domain of the following function. Express your answer in interval notation.

$$f(x) = -2x + 1.5$$

- A) $(-\infty, \infty)$ B) $(-1.5, \infty)$ C) $(1.5, \infty)$ D) $(-2, 1.5)$ E) $(-2, \infty)$

31. Find the inverse function of f . $f(x) = x^5 + 5$

- A) $f^{-1}(x) = -\sqrt[5]{x} + 5$ B) $f^{-1}(x) = \sqrt[5]{x} + 5$ C) $f^{-1}(x) = -\sqrt[5]{x+5}$
D) $f^{-1}(x) = \sqrt[5]{x-5}$ E) $f^{-1}(x) = \sqrt[5]{x} - 5$

32. Solve the equation $4x + 8y = 6$ for y in terms of x .

- A) $y = \frac{5}{9} + \frac{7}{9}x$ B) $y = \frac{1}{2} + \frac{3}{4}x$ C) $y = \frac{1}{2} - \frac{3}{4}x$
D) $y = \frac{3}{4} + \frac{1}{2}x$ E) $y = \frac{3}{4} - \frac{1}{2}x$

33. Solve the equation $5x + y - 6 = 0$ for y in terms of x .

- A) $y = 6 - 5x$ B) $y = 5 - 6x$ C) $y = \frac{6}{5}x$ D) $y = -\frac{5}{6}x$ E) $y = 11x$

34. Determine the equation(s) of any vertical asymptotes of $f(x) = \frac{2x+2}{x^2-2x}$.

- A) $x = -2$ only B) $x = 0$ only C) $x = 2$ and $x = 0$ D) $x = 2$ only E) none

35. An airline charges \$350 for a round-trip flight from New York to Los Angeles if the ticket is purchased at least 7 days in advance of travel. Otherwise, the price is \$800. If a total of 82 tickets are purchased at a total cost of \$39,500, find the number of \$350 tickets sold.

- A) 60 B) 26 C) 62 D) 24 E) 58

36. One acetic acid solution is 60% water and another is 80% water. How many liters of 80% solution should be mixed with 60% solution to produce 20 liters of a solution that is 63% water?

- A) 11 B) 3 C) 9 D) 14 E) 6

37. Find all solutions of the following equation.

$$6\sqrt{x+6} - \sqrt{2x-5} = 17$$

- A) $x = 0$ B) $x = -3, 6$ C) $x = 5$ D) $x = 3$ E) $x = 0, 4$

38. Divide $4x^2 + 8x + 4$ by $2x + 4$.

- A) $2 - \frac{x}{x+2}$ B) $3x - \frac{3}{x+2}$ C) $3x - \frac{2}{x+2}$ D) $2x + \frac{2}{x+2}$ E) $2 + \frac{x}{x+2}$

39. Find the slope of the line passing through the points $\left(4, \frac{1}{4}\right)$ and $\left(\frac{1}{3}, \frac{1}{5}\right)$.

- A) $-\frac{3}{220}$ B) $\frac{8}{225}$ C) $\frac{225}{8}$ D) $\frac{220}{3}$ E) $\frac{3}{220}$

40. Find the slope of the line with equation: $-y + 7x = 3$

- A) 4 B) 3 C) -7 D) -3 E) 7

41. Find the slope-intercept form of the equation of the line that passes through the given point and has the indicated slope.

point: $(-1, 4)$ slope: $m = 4$

- A) $y = 4x + 4$ B) $y = 4x - 17$ C) $y = 4x + 8$ D) $y = 4x$ E) $y = 4x - 1$

42. The decibel (dB) is a unit that is used to express the relative loudness of two sounds. One application of decibels is the relative value of the output power of an amplifier with respect to the input power. The *relative value* D of power level P_1 with respect to power level P_2 is given (in units of dB) in terms of the logarithm of their ratio as follows:

$$D = 10 \log \frac{P_1}{P_2}$$

where the values of P_1 and P_2 are expressed in the same units, such as watts (W) . If $P_2 = 76W$, find the value of P_1 at which $D = 0.8$. Round your answer to nearest integer.

- A) 82 B) 61 C) 96 D) 91 E) 86

43. If the expression $(y + 4)^5$ is expanded, the highest power of x would be:

- A) 1 B) 2 C) 3 D) 4 E) 5

44. The profit in dollars from selling x DVD players is given by $40x - 320$. Set up and solve an equation to find out how many DVD players must be sold to obtain a profit of \$400.

- A) 17 B) 18 C) 21 D) 23 E) 19

45. Find the center of the graph of the circle. $x^2 + y^2 + 2x - 12y - 159 = 0$

- A) (-1, 6) B) (1, 6) C) (-2,12) D) (1,-6) E) (12,-2)

46. Simplify the rational expression $\frac{x^3 - 512}{x^2 - 64}$ and indicate the values of the variable for which the expression is defined.

- A) $x \neq 0$ B) $x \neq 0, -8$ C) $x \neq -8$ D) $x \neq 8$ E) $x \neq 8, -8$

47. In 2001, the average weekday volume of traffic on a particular stretch of the Princess Parkway was 172,000 vehicles. By 2006, the volume had increased to 231,000 vehicles per weekday. By how many vehicles did the traffic increase per year?

- A) 21,500 B) 7375 C) 34,400 D) 46,200 E) 11,800

1. D
2. C
3. E
4. B
5. E
6. E
7. D
8. B
9. E
10. C
11. A
12. A
13. A
14. E
15. A
16. D
17. A
18. C
19. D
20. D
21. A
22. D
23. A
24. E
25. A
26. E
27. E
28. A
29. B
30. A
31. D
32. E
33. A
34. C
35. E
36. B
37. D
38. D
39. E
40. E
41. C
42. D
43. E
44. B
45. A
46. E

47. E