

1. Give the solution set for: $-|x-3|+9 > -4$

- a. $(-\infty, -16) \cup (10, \infty)$
- b. $(-16, 16)$
- c. $(-10, 16)$
- d. $(-\infty, +\infty)$
- e. Empty set

2. Simplify: $\sqrt[3]{27x^3y^5z^6}$

- a. $3xy^2z^3$
- b. $3y^2z^3$
- c. $9xy^2z^3$
- d. $9xyz^2(\sqrt[3]{y^2})$
- e. $3xyz^2(\sqrt[3]{y^2})$

3. If X varies directly with Y squared, and X = 5 when Y = 6, find X when Y = 3.

- a. 0.8
- b. 2.5
- c. 5.0
- d. 1.25
- e. 5.5

4. Simplify the following: $\left(\frac{x^{-3}y^{-2}z^5}{z^{-2}yx^{-1}}\right)^2$ for $x, y, z \neq 0$

- a. $\frac{z^{14}}{x^4y^6}$
- b. $\frac{x^2y^2}{z^6}$
- c. $\frac{x^2}{z^6y^2}$
- d. $\frac{x^8z^{14}}{y^6}$
- e. $x^8y^2z^{21}$

5. Simplify: $\sqrt{-16}(\sqrt{-25} + \sqrt{25})$

- a. -40
- b. $20 - 20i$
- c. 0
- d. $-20 + 20i$
- e. $40i$

6. Solve for x: $b^{3x-9} = (b^2)^{2x+8}$

- a. -17 b. -25 c. -73 d. $\frac{25}{7}$ e. $-\frac{25}{7}$

7. The sum of two distinct integers is three times the smaller, while their product is twice their sum. The smaller integer is which of the following:

- a. 0 b. 3 c. 6 d. -3 e. -6

8. How many pounds of candy worth \$3.50 per pound should be mixed with candy worth \$5.00 per pound to produce 12 pounds of candy worth \$4.00 per pound?

- a. 4 pounds b. 6 pounds c. 4.25 pounds d. 8 pounds e. none of these

9. Simplify: $\frac{1}{1 + \frac{1}{1 + \frac{1}{2}}}$

- a. $\frac{2}{3}$ b. $\frac{1}{3}$ c. $\frac{3}{5}$ d. $\frac{3}{8}$ e. $\frac{2}{5}$

10. Which line below is perpendicular to the line $2y - 3x = 5$?

- a. $-4x + 6y = 15$
b. $4x + 6y = 15$
c. $-15x + 10y = -4$
d. $-15x + 10y = 4$
e. $3x + 2y = 5$

11. Solve for x: $\frac{7x-1}{8} + \frac{x}{4} = \frac{3x}{2} + 1$

- a. $x = -3$ b. $x = \frac{2}{5}$ c. $x = -\frac{3}{13}$ d. $x = \frac{2}{11}$ e. none of these

12. Add and simplify: $\frac{3}{x+2} + \frac{2}{x^2-4}$

- a. $2x^2 - 10x + 4$ b. $\frac{5x-16}{x^2-4}$ c. $\frac{5}{x^2+x-2}$ d. $\frac{3x-4}{x^2-4}$ e. none of these

13. Ashley wants to carpet a square room. She measures the diagonal of the room to be 20 feet. How much carpet (in square feet) does she need?

- a. 100 b. 200 c. 400 d. 800 e. none of these.

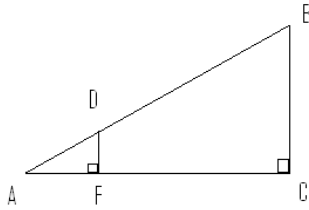
14. Solve for x: $\log_{10}(x^2 - 9) - \log_{10}(x + 3) = 2$

- a. 5 b. 23 c. 97 d. 103 e. $2^{10} + 3$

15. Given that: $f(x) = -x^2 + x$ and $g(x) = \frac{-x}{2}$ Find $(f \circ g)(x)$.

- a. $\frac{-x^2 - 2x}{4}$
b. $\frac{-x^2 + x}{2}$
c. $\frac{x^2 + 2x}{4}$
d. $\frac{x^2 - 2x}{4}$
e. $\frac{x^2 - x}{2}$

16. In the Right Triangles below, find the length DB given the following:



$$AD = 5$$

$$AF = 4$$

$$DF = 3$$

$$AC = 16$$

- a. $DB = 20$ b. $DB = 12$ c. $DB = 16$ d. $DB = 15$ e. none of these
17. Factor completely: $x^3 + 2x^2 - 9x - 18$
- a. $(x - 3)(x + 3)(x + 2)$
b. $-(x - 3)(x - 3)(x + 2)$
c. $-(x + 3)(x + 3)(x + 2)$
d. $(x^2 + 3x - 9)(x + 2)$
e. $(x + 6)(x - 3)(x + 2)$
18. Which of the following is a factor in the complete factorization of $27x^3 - 8y^3$.
- a. $9x^2 - 12xy + 4y^2$
b. $9x^2 + 12xy + 4y^2$
c. $9x^2 + 6xy - 4y^2$
d. $9x^2 - 6xy + 4y^2$
e. $9x^2 + 6xy + 4y^2$
19. What is the remainder when $x^3 + 2x^2 - 3x + 1$ is divided by $x + 1$?
- a. 7 b. -5 c. -3 d. 5 e. 0

20. Find the y-intercept of the line through the points (a,b) and (b,a). Assume $a \neq b$.

- a. $b - a$
- b. $a + b$
- c. $a - b$
- d. $-a - b$
- e. -1

21. Suppose the speed of a passenger train is 25 km per hour faster than the speed of a freight train. The passenger train travels 600 km in the same time it takes the freight train to travel 500 km. Find the speed of the passenger train.

- a. 125 km/h b. 100 km/h c. 150 km/h d. 50 km/h e. none of these

22. Simplify completely: $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{x^3} + \frac{1}{y^3}}$

- a. $\frac{x + y}{x^3 + y^3}$
- b. $\frac{x^3 + y^3}{x + y}$
- c. $\frac{x^2 y^2}{x^2 - xy + y^2}$
- d. $\frac{x^2 y^3 + x^3 y^2}{x^3 + y^3}$
- e. none of these

23. What is the radius of the circle $x^2 - 4x + y^2 + 2y - 7 = 0$?

- a. 2 b. $\sqrt{7}$ c. 7 d. $2\sqrt{3}$ e. $\sqrt{2}$

24. Which of the following is a solution of the equation $r^2 + 9 = 0$?
- $3+i$
 - $3+3i$
 - -3
 - $-3i$
 - The equation has no solutions.
25. Which of the following is NOT a term in the expansion of: $\left(3x^{\frac{1}{3}} + y^{\frac{1}{3}}\right)^3$
- $27x$
 - y
 - $27x^{\frac{1}{3}}y^{\frac{2}{3}}$
 - $9x^{\frac{1}{3}}y^{\frac{2}{3}}$
 - $27x^{\frac{2}{3}}y^{\frac{1}{3}}$
26. Gideon threw a tennis ball into the air. The height of the ball above the ground after t seconds is given by $h(t) = -16t^2 + 36t + 4$, where distance is measured in feet. What is the maximum height (in feet) of the ball above the ground?
- $97/4$
 - 36
 - $9/8$
 - 4
 - None of these
27. Bill by himself can paint a house in ten hours. If he hires Joe to help, they can paint the house in six hours. If he lets Joe work alone, how long will it take him to paint the house?
- 8 hrs
 - 10 hrs
 - 15 hrs
 - 12 hrs
 - 20 hrs
28. The cooling system of a car has a capacity of 15 liters. If the system is filled with a mixture of 40% antifreeze, how much of the mixture should be drained and replaced by pure antifreeze so that the system is filled with a solution that is 60% antifreeze?
- 5 liters
 - 2.5 liters
 - 4 liters
 - 10 liters
 - 7.5 liters
29. The area of a triangle is 1800 sq ft. If the height is four times the base, what is the height of the triangle?
- 30 ft
 - 120 ft
 - $60\sqrt{2}$ ft
 - 450 ft
 - 90 ft

30. Simplify the expression $\frac{(x+h)^2 - x^2}{h}$ for $h \neq 0$

- a) h
- b) $x + h$
- c) $2(x + h)$
- d) $2xh + h$
- e) $2x + h$

31. Given that 0 degrees Celsius is 32 degree Fahrenheit and 100 degrees Celsius is 212 degrees Fahrenheit, what is the linear equation that generally shows the relationship between degrees Celsius and degrees Fahrenheit.

- a) $F = (9/5)C + 32$
- b) $F = (5/9)C + 32$
- c) $5C - 9F = 160$
- d) $5F + 9C = 160$
- e) None of the above

32. Which of the following is the equation of a plane in 3-dimensional Euclidean space?

- a) $x = 3t, y = 2t, z = t$
- b) $x^2 + y^2 + z^2 = 1$
- c) $z = x^2 + y^2$
- d) $z = x^2 - y^2$
- e) $x + 2y + 3z = 6$

33. Suppose \$1000 is invested at a constant rate, compounded annually, for 30 years. At the end of the 6th year, the investment had doubled. What will be the total value (to the nearest thousand) at the end of 30 years?

- a) \$32,000
- b) \$27,000
- c) Not enough information is given
- d) \$10,000
- e) \$64,000

34. Determine the solution set for the inequality $\frac{x}{x^2+x} > 0$
- $(0, \infty)$
 - $(-1, \infty)$
 - $(-1, 0) \cup (0, \infty)$
 - $(-\infty, -1)$
 - $(-\infty, 0)$
35. Consider the equation $\log_2(k) = x^2$. Find x if $k = 8$.
- 4
 - ± 2
 - 2
 - $\sqrt{3}$
 - $\pm\sqrt{3}$
36. Find the 100th term in the sequence 1,3,0,5,7,0,9,11,0,13,15,0, . . .
- 0
 - 101
 - 131
 - 133
 - 135
37. Simplify the expression $(1 - (1 - (1 - a)^{-1})^{-1})^{-1}$ for $a \neq 1$
- $\frac{1}{a}$
 - $\frac{a-1}{a}$
 - a
 - $\frac{1}{2-a}$
 - none of these.
38. Find the inverse function $f^{-1}(x)$ given that $f(x) = 2\log_3(x)$
- $f^{-1}(x) = \frac{3^x}{2}$
 - $f^{-1}(x) = \sqrt{3^x}$
 - $f^{-1}(x) = \sqrt{\frac{3^x}{2}}$
 - $f^{-1}(x) = \sqrt{3^{x^2}}$
 - $f^{-1}(x) = \sqrt{x^3}$

39. Suppose that P is directly proportional to T, and inversely proportional to V. If V is doubled and T is halved, by what factor will P be multiplied?

- a. P doesn't change
- b. 2
- c. $\frac{1}{2}$
- d. 4
- e. $\frac{1}{4}$

40. Find the determinant: $\begin{vmatrix} 1 & 1 & -1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \end{vmatrix}$

- a. 3
- b. -1
- c. 1
- d. -3
- e. 2

EXTRA QUESTIONS:

1. Which of the following is equivalent to $\frac{x^5 - 16}{x^2 + 4}$?

(a) $x^3 - 4$

(b) $x^3 - \frac{16}{x^2 + 4}$

(c) $x^3 + 4x - \frac{16}{x^2 + 4}$

(d) $x^3 - 4x + \frac{16x - 16}{x^2 + 4}$

(e) None of the above.

2. Find the line which passes through the point (1,3) that is parallel to the line which passes through (0,2) and (3,-7).

a. $y = \frac{1}{3}x + \frac{8}{3}$

b. $y = -3x + 6$

c. $y = 3x$

d. $y = -\frac{1}{3}x + \frac{10}{3}$

e. none of the above

3. Solve for x: $\log_b(x^2 - 9) - \log_b(x + 3) = 2$.

a. $b^2 + 3$

b. $b - 7$

c. $b - 3$

d. 0

e. $\frac{1}{b} - 7$

4. Which of the following is the coefficient of x^3 in the final simplification of $(x+2)^5$?

a. 20

b. 30

c. 32

d. 40

e. 80

5. What is the area of the triangle whose sides have lengths 5, 5, and 8?

a. 12

b. 16

c. 20

d. 32

e. None of these

6. Find the center of the circle with the equation: $x^2 + y^2 + 4x + 2y - 20 = 0$

- a. (0,0) b. (-2,-1) c. (2,1) d. (-2,1) e. (2,-1)

7. Simplify: $\frac{x^3 - y^3}{x - y}$

- a. $x^2 - y^2$
b. $x^2 + y^2$
c. $x^2 - xy + y^2$
d. $x^2 + xy - y^2$
e. $x^2 + xy + y^2$

8. Suppose that Jim can run a half-marathon (assume that is 13.1 miles) in 1 hour and 44 minutes. If he can run a 5-kilometer race (assume 1 kilometer = .62 miles) at the same rate, which answer below best approximates his time to run a 5-kilometer race.

- a) 39 minutes
b) 34 minutes
c) 25 minutes
d) 1 hour and 4 minutes
e) None of the above

Answer Key:

1. c
2. e
3. d
4. a
5. d
6. b
7. b
8. d
9. c
10. b
11. a
12. d
13. b
14. d
15. a
16. d
17. a
18. e
19. d
20. b
21. c
22. c
23. d
24. d
25. c
26. a
27. c
28. a
29. b
30. e
31. a
32. e
33. a
34. c
35. e
36. d
37. c
38. b
39. e
40. c

Answer Key for extra questions:

1. d
2. b
3. a
4. d
5. a
6. b
7. e
8. c