
1. Which is an irrational number?

A) 0

B) π

C) $-\frac{1}{3}$

D) $\sqrt{9}$

2. The expression $x^2(x + 2) - (x + 2)$ is equivalent to

A) x^2

B) $x^2 - 1$

C) $x^3 + 2x^2 - x + 2$

D) $(x + 1)(x - 1)(x + 2)$

3. Express in simplest form: $\frac{\frac{4-x^2}{x^2+7x+12}}{\frac{2x-4}{x+3}}$

4. When factored completely, the expression $3x^3 - 5x^2 - 48x + 80$ is equivalent to

A) $(x^2 - 16)(3x - 5)$

B) $(x^2 + 16)(3x - 5)(3x + 5)$

C) $(x + 4)(x - 4)(3x - 5)$

D) $(x + 4)(x - 4)(3x - 5)(3x - 5)$

5. When $x^{-1} - 1$ is divided by $x - 1$, the quotient is

A) -1

B) $\frac{1}{x}$

C) $\frac{1}{x^2}$

D) $\frac{1}{(x-1)^2}$

6. Solve algebraically for x : $\frac{1}{x+3} - \frac{2}{3-x} = \frac{4}{x^2-9}$

7. The expression $\frac{x^2+9x-22}{x^2-121} \div (2-x)$ is equivalent to

A) $x - 11$

B) $\frac{1}{x-11}$

C) $11 - x$

D) $\frac{1}{11-x}$

8. Express in simplest form:

$$\frac{\frac{1}{2} - \frac{4}{d}}{\frac{1}{d} + \frac{3}{2d}}$$

9. Solve the equation below algebraically, and express the result in simplest radical form:

$$\frac{13}{x} = 10 - x$$

10. Solve $|-4x + 5| < 13$ algebraically for x .

11. What is the range of $f(x) = |x - 3| + 2$?

A) $\{x|x \geq 3\}$

B) $\{y|y \geq 2\}$

C) $\{x|x \in \text{real numbers}\}$

D) $\{y|y \in \text{real numbers}\}$

12. The expression $\left(\sqrt[3]{27x^2}\right)\left(\sqrt[3]{16x^4}\right)$ is equivalent to

A) $12x^2\sqrt[3]{2}$

B) $12x\sqrt[3]{2x}$

C) $6x\sqrt[3]{2x^2\cdot 2}$

D) $6x^2\sqrt[3]{2}$

13. The expression $\sqrt[4]{16x^2y^7}$ is equivalent to

- A) $2x^{\frac{1}{2}}y^{\frac{7}{4}}$ B) $2x^8y^{28}$ C) $4x^{\frac{1}{2}}y^{\frac{7}{4}}$ D) $4x^8y^{28}$

14. Express the equation below in simplest radical form.

$$5\sqrt{3x^3} - 2\sqrt{27x^3}$$

15. The solution set of $\sqrt{3x + 16} = x + 2$ is

- A) $\{-3, 4\}$ B) $\{-4, 3\}$ C) $\{3\}$ D) $\{-4\}$

16. The roots of the equation $2x^2 + 7x - 3 = 0$ are

- A) $-\frac{1}{2}$ and -3 B) $\frac{1}{2}$ and 3 C) $\frac{-7 \pm \sqrt{73}}{4}$ D) $\frac{7 \pm \sqrt{73}}{4}$

17. The roots of the equation $x^2 - 10x + 25 = 0$ are

- A) imaginary B) real and irrational
C) real, rational, and equal D) real, rational, and unequal

18. The expression $2i^2 + 3i^3$ is equivalent to

- A) $-2 - 3i$ B) $2 - 3i$ C) $-2 + 3i$ D) $2 + 3i$
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19. The expression $(x + i)^2 - (x - i)^2$ is equivalent to

- A) 0 B) -2 C) $-2 + 4xi$ D) $4xi$

20. Solve algebraically for all values of x :

$$x^4 + 4x^3 + 4x^2 = -16x$$

21. Which values of x are in the solution set of the following system of equations?

$$y = 3x - 6$$

$$y = x^2 - x - 6$$

- A) $0, -4$ B) $0, 4$ C) $6, -2$ D) $-6, 2$

22. Which function is one-to-one?

- A) $f(x) = |x|$ B) $f(x) = 2^x$ C) $f(x) = x^2$ D) $f(x) = \sin x$

23. If $f(x) = x^2 - 6$ and $g(x) = 2x - 1$, determine the value of $(g \bullet f)(-3)$.

24. If $f(x) = x^2 - 6$, find $f^{-1}(x)$.

25. If d varies inversely as t , and $d = 20$ when $t = 2$, what is the value of t when $d = -5$?

- A) 8 B) 2 C) -8 D) -2

26. What is the sum of the first 19 terms of the sequence 3, 10, 17, 24, 31, ...?

- A) 1188 B) 1197 C) 1254 D) 1292

27. The sum of the first eight terms of the series $3 - 12 + 48 - 192 + \dots$ is

- A) -13,107 B) -21,845 C) -39,321 D) -65,535

28. Which expression is equivalent to $(9x^2y^6)^{-\frac{1}{2}}$?

- A) $\frac{1}{3xy^3}$ B) $3xy^3$ C) $\frac{3}{xy^3}$ D) $\frac{xy^3}{3}$

29. When simplified, the expression $\left(\frac{w^{-5}}{w^{-9}}\right)^{\frac{1}{2}}$ is equivalent to

- A) w^{-7} B) w^2 C) w^7 D) w^{14}

30. The solution set of the equation $4^{x^2+4x} = 2^{-6}$ is

- A) $\{1, 3\}$ B) $\{-1, 3\}$ C) $\{-1, -3\}$ D) $\{1, -3\}$
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31. Susie invests \$500 in an account that is compounded continuously at an annual interest rate of 5%, according to the formula $A = Pe^{rt}$, where A is the amount accrued, P is the principal, r is the rate of interest, and t is the time, in years. Approximately how many years will it take for Susie's money to double?

- A) 1.4 B) 6.0 C) 13.9 D) 14.7

32. If $\log 2 = a$ and $\log 3 = b$, the expression $\log \dots$ is equivalent to

- A) $2b - a + 1$ B) $2b - a - 1$ C) $b^2 - a + 10$ D) $\frac{2b}{a+1}$

33. If $r = \sqrt[3]{\frac{A^2B}{C}}$, then $\log r$ can be represented by

- A) $\frac{1}{6}\log A + \frac{1}{3}\log B - \log C$ B) $3(\log A^2 + \log B - \log C)$
C) $\frac{1}{3}\log(A^2 + B) - C$ D) $\frac{2}{3}\log A + \frac{1}{3}\log B - \frac{1}{3}\log C$

34. Solve algebraically for all values of x :

$$\log_{(x+4)}(17x - 4) = 2$$

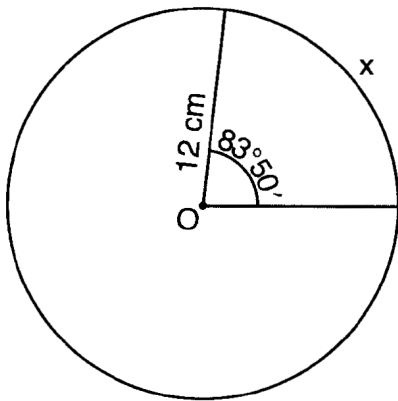
35. Solve algebraically for all values of x :

$$\log_{(x+3)}(2x + 3) + \log_{(x+3)}(x + 5) = 2$$

36. Find, to the *nearest tenth*, the radian measure of 206° .

37. Convert 3 radians to degrees and express the answer to the *nearest minute*.

38. Circle O shown below has a radius of 12 centimeters. To the *nearest tenth of a centimeter*, determine the length of the arc, x subtended by an angle of



39. The value of \tan
to the *nearest ten-thousandth* is

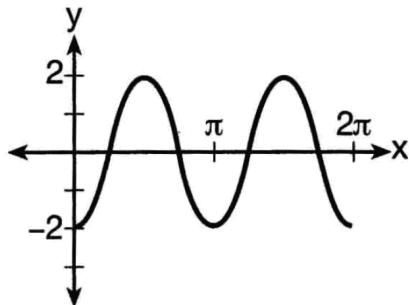
- A) -1.3407 B) -1.3408 C) -1.3548 D) -1.354

40. Express the product of $\cos 30^\circ$ and $\sin 45^\circ$ in simplest radical form.

41. Which equation represents a graph that has a period of 4π ?

- A) $y = 3 \sin \frac{1}{2}x$ B) $y = 3 \sin 2x$ C) $y = 3 \sin \frac{1}{4}x$ D) $y = 3 \sin 4x$

42. Which equation represents the graph below?



- A) $y = -2 \sin 2x$ B) $y = -2 \sin \frac{1}{2}x$
C) $y = -2 \cos 2x$ D) $y = -2 \cos \frac{1}{2}x$

43. Solve algebraically for all exact values of x in the interval $0 \leq x < 2\pi$:

$$2 \sin^2 x + 5 \sin x = 3$$

44. Starting with $\sin^2 A + \cos^2 A = 1$, derive the formula $\tan^2 A + 1 = \sec^2 A$.

45. The expression $\sin(\theta + 90)^\circ$ is equivalent to

- A) $-\sin \theta$ B) $-\cos \theta$ C) $\sin \theta$ D) $\cos \theta$

46. If $\sin A = \frac{2}{3}$ where $0^\circ < A < 90^\circ$, what is the value of $\sin 2A$?

A) $\frac{2\sqrt{5}}{3}$

B) $\frac{2\sqrt{5}}{9}$

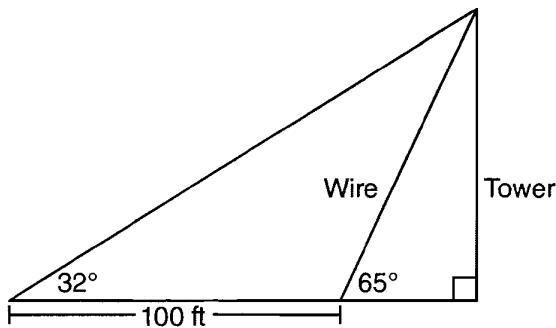
C) $\frac{4\sqrt{5}}{9}$

D) $-\frac{4\sqrt{5}}{9}$

47. Solve the equation $2 \tan C - 3 = 3 \tan C - 4$ algebraically for all values of C in the interval $0^\circ \leq C < 360^\circ$.

48. If $\sec(a + 15)^\circ = \csc(2a)^\circ$, find the smallest positive value of a , in degrees.

49. The diagram below shows the plans for a cell phone tower. A guy wire attached to the top of the tower makes an angle of 65 degrees with the ground. From a point on the ground 100 feet from the end of the guy wire, the angle of elevation to the top of the tower is 32 degrees. Find the height of the tower, to the nearest foot.



50. In a triangle, two sides that measure 6 cm and 10 cm form an angle that measure 80° . Find, to the nearest degree, the measure of the smallest angle in the triangle.

56. The scores of one class on the Unit 2 mathematics test are shown in the table below

Unit 2 Mathematics Test

| Test Score | Frequency |
|------------|-----------|
| 96 | 1 |
| 92 | 2 |
| 84 | 5 |
| 80 | 3 |
| 76 | 6 |
| 72 | 3 |
| 68 | 2 |

Find the population standard deviation of these scores, to the *nearest tenth*.

57. A spinner is divided into eight equal sections. Five sections are red computations, and three are green. If the spinner is spun three times, what is the probability that it lands on red *exactly* twice?

A) $\frac{25}{64}$

B) $\frac{45}{512}$

C) $\frac{75}{512}$

D) $\frac{225}{512}$
