

Select the best choice to answer each question.

$x = \frac{-b}{2a}$ $x = \frac{6}{2(-1)}$
 $x = -3$

1. For the function $y = -x^2 - 6x - 7$, find the vertex and axis of symmetry.
- ~~a.~~ vertex (3, -2); axis of symmetry $x = 3$ ~~b.~~ vertex (-3, 2); axis of symmetry $x = 4$
 c. vertex (-3, 2); axis of symmetry $x = -3$ ~~d.~~ vertex (3, -2); axis of symmetry $x = -4$

2. If the graph of $y = ax^2 + bx + c$ opens down, which of the following must be true?

- a. $a < 0$ b. $a > 0$ c. $c < 0$ d. $c > 0$

3. Which function does *not* have a maximum value?

- a. $y = -x^2 - 5x - 6$ b. $y = -x^2 - x - 6$
 c. $y = 3x^2 - 15x + 2$ d. $y = 49 - x^2$

4. What is the vertex of $y = -3(x - 2)^2 - 4$?

- a. (-2, -4) b. (-2, 4) c. (2, -4) d. (2, 4)

5. What are the x-intercepts of $y = -2(x - 7)(x + 2)$?

- a. -7 and 2 b. 7 and -2 c. 14 and -4 d. 14 and -2

6. Factor the expression $m^2 - 4m - 21$.

- $(m - 7)(m + 3)$
a. $(m - 7)(m - 3)$ b. $(m - 7)(m + 3)$
c. $(m + 7)(m - 3)$ d. $(m + 7)(m + 3)$

7. What are the roots of the equation $z^2 + 11z - 42 = 0$?

- $(z + 14)(z - 3) = 0$ $z = -14, z = 3$
a. -3, -14 b. 3, -14 c. -3, 14 d. 3, 14

8. Simplify the expression $\frac{2}{(2 + \sqrt{3})}$

- $\frac{2 - \sqrt{3}}{(2 + \sqrt{3})(2 - \sqrt{3})} = \frac{2 - \sqrt{3}}{4 - 3} = \boxed{2 - \sqrt{3}}$
a. $\frac{4}{13}$ b. 2 c. $4 - 2\sqrt{3}$ d. $\frac{4 - 2\sqrt{3}}{-5}$

9. What are the solutions of $-3 - y^2 = 24$?

- $-y^2 = 27 \rightarrow \sqrt{y^2} = \sqrt{27} \rightarrow \pm 3\sqrt{3}$
a. $\pm 3\sqrt{3}$ b. $\pm 3i\sqrt{3}$ c. $\pm 9\sqrt{3}$ d. $\pm 9i\sqrt{3}$

10. What is the standard form of the expression $\frac{i}{2+i}$?

$$\frac{i}{2+i} \cdot \frac{2-i}{2-i} = \frac{2i-i^2}{4-i^2} = \frac{2i+1}{5} = \frac{1+2i}{5}$$

- a. $\frac{1}{2}i+1$ b. $\frac{2}{3}i-1$ c. $\frac{i}{2}+1$ d. $\frac{2}{5}i+\frac{1}{5}$

11. What is the simplified form of $\frac{8a^2bc^{-1}}{12ab^3c}$?

- a. $\frac{2ab^2c^2}{3}$ b. $\frac{2a}{3b^2c^2}$ c. $\frac{2a}{3b^2}$ d. $\frac{2a}{3bc}$

12. What is the degree of the polynomial $h(t) = -8t^2 + 5 - 3t^3$?

Largest power

- a. 1 b. 2 c. 3 d. 4

13. What is the complete factorization of $3x^4 - 3x^2$?

$$3x^4 - 3x^2 = 3x^2(x^2 - 1) = 3x^2(x+1)(x-1)$$

- a. $3x^2(x^2 - 1)$ b. $3x^2(x - 1)(x + 1)$
 c. $3x(x - 1)(x + 1)$ d. $2(x^4 - x^2)$

14. If $x + 3$ is a factor of $x^3 - x^2 - 17x - 15$, what is another factor?

- a. $x + 1$ b. $x - 1$ c. $x + 5$ d. $x - 3$

15. What is the value of $(-243)^{3/5}$?

$$(\sqrt[5]{-243})^3 = -3^3 = -27$$

Use graph. calc. to find x-ints.

- a. -27 b. -3 c. 3 d. 27

16. What is the solution to $3x^5 + 350 = -379$?

$$3x^5 = -729 \implies \sqrt[5]{x^5} = \sqrt[5]{-729}$$

- a. $-\frac{729}{\sqrt[3]{3}}$ b. -3 c. 3 d. $\frac{729}{\sqrt[3]{3}}$

17. Which expression is the simplest form of $4\sqrt[3]{32} - \sqrt[3]{32}$?

$$3\sqrt[3]{32} = 3 \cdot 2\sqrt[3]{8} = 6\sqrt[3]{4}$$

- a. $3\sqrt[3]{4}$ b. $6\sqrt[3]{4}$ c. 6 d. $16\sqrt[3]{2} - 4$

18. If $h(t) = t^{2/3} - 9$ and $j(t) = 3t + 5t^{2/3}$, what is $h(t) - j(t)$?

- a. $-4t^{2/3} - 3t - 9$ b. $4t^{2/3} + 3t + 9$
 c. $3t + 6t^{4/3}$ d. $-7t^{7/3} - 9$

$$t^{2/3} - 9 - (3t + 5t^{2/3}) = -4t^{2/3} - 3t - 9$$

19. What is $g(f(x))$ if $f(x) = 3x^2$ and $g(x) = 2x^{1/2}$?

- a. $x\sqrt{6}$ b. $2x\sqrt{3}$ c. $6\sqrt{x}$ d. $6x$

$$2(3x^2)^{1/2} = 2 \cdot 3^{1/2} x = 2\sqrt{3}x$$

20. What is (are) the solution(s) to $(x-2)^2 = \sqrt{2x-1}$? $x^2 - 4x + 4 = 2x - 1$
 $x^2 - 6x + 5 = 0$
 $(x-1)(x-5) = 0$
- a. $x = 1$ b. $x = 5$ c. $x = 1$ and 5 d. no solution
21. Which function represents exponential growth? $a > 1$
 \downarrow
- a. $u(t) = -7.0\left(\frac{2}{3}\right)^t$ b. $u(t) = -7.0\left(\frac{3}{2}\right)^t$ $\rightarrow x=1, x=5$
extraneous!
- c. $u(t) = 7.0(0.8)^t$ d. $u(t) = 7.0\left(\frac{9}{10}\right)^t$
22. What is the horizontal asymptote of the function $y = 2(0.3)^{x-1} - 4$? -4
- a. $y = -4$ b. $y = 0.3$ c. $y = 2$ d. $y = 4$
23. Which expression is equivalent to x ? $\log_{10} 10^x = x$
- a. $\log x$ b. $\log 2^x$ c. $\log 10^x$ d. $\log 100^x$
24. What is an equivalent expression for $2 \log_4 3 + \log_4 2$? $\log_4 9 \cdot 2 = \log_4 18$
- a. $2 \log_4 6$ b. $\log_4 6$ c. $\log_4 12$ d. $\log_4 18$
25. Which of the following is not equivalent to $\log_5 8$? $(4 \cdot 2)$
 $\log_5 8$
- a. $\frac{\log 8}{\log 5}$ b. $2 \log_5 4$ c. $3 \log_5 2$ d. $\log_5 4 + \log_5 2$
- $\log_5 16$ $\log_5 8$
26. What is the solution to the equation $\log_4 4x + 2 \log_4 x = 4$? $\log_4 (4x^3) = 4$
 $4^4 = 4x^3$
 $256 = 4x^3$
 $64 = x^3$
 $x = 4$
- a. 1 b. 2 c. 3 d. 4
27. Which function represents exponential growth?
- a. $u(t) = -7.0\left(\frac{2}{3}\right)^t$ b. $u(t) = -7.0\left(\frac{3}{2}\right)^t$
- c. $u(t) = 7.0(0.8)^t$ d. $u(t) = 7.0\left(\frac{9}{10}\right)^t$
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- a. $2 \log_4 6$ b. $\log_4 6$ c. $\log_4 12$ **d. $\log_4 18$**

31. Which of the following is not equivalent to $\log_5 8$?

- a. $\frac{\ln 8}{\ln 5}$** b. $2 \log_5 4$ c. $3 \log_2 2$ d. $\log_5 4 + \log_5 2$

32. What is the solution to the equation $\log_4 4x + 2 \log_4 x = 4$?

- a. 2 **b. 4** c. 6 d. 8

33. What are the asymptotes of the function $y = \frac{4x^2 + 3x + 1}{x^2 - 1}$?

$x^2 - 1 = 0$
 $x = \pm 1$ $y = 4$

- a. $x = 0, y = 0$ b. $x = 1, y = \frac{1}{4}$
 c. $x = 0, x = 1, y = 4$ **d. $x = -1, x = 1, y = 4$**

34. What is the simplified form of $\frac{2x^2 + x - 10}{x^2 + x - 6}$?

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

- a. $\frac{2x-5}{x-3}$ b. $\frac{2x-5}{x+3}$ c. $\frac{2x+5}{x-3}$ **d. $\frac{2x+5}{x+3}$**

35. Which expression is the product of $\frac{24a^2b}{13abc} \cdot \frac{39a^2c^3}{8b^2c^2}$?

$\frac{3 \cancel{24} a^2 b}{13 abc} \cdot \frac{3 \cancel{39} a^2 c^3}{8 b^2 c^2} = \frac{9a^3}{b^2}$

- a. $\frac{9a^3}{b^2}$** b. $9a^3b^2$ c. $\frac{117a^3b^2}{13b^2}$ d. $\frac{117a^3b^2}{13}$

36. What is the simplified form of $\frac{x^2 + 8x}{4x} \div \frac{2x^2 + 15x - 8}{2x - 1}$?

$\frac{x(x+8)}{4x} \cdot \frac{2x-1}{(2x-1)(x-8)}$

- a. $\frac{1}{4}$** b. $\frac{2}{x+8}$ c. $\frac{x+8}{2}$ d. $\frac{(x+8)^2}{4}$

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