

Your exam will be cumulative. Any topic we studied this year may be on the exam. The best way to study math is to practice problems. Please complete this study guide; however, don't only use this guide. You should re-work your old tests and quizzes, review your notes and homework, and seek help if needed.

1. What is the domain of the function that contains the points (-3, 0), (0, 4), (-2, 5), and (6,4)?

- A. {-3, 6} (B) {-3, -2, 0, 6} C. {0,4,5,6} D. {-3, -2, 0, 4, 5, 6}

2. If $g(x) = x^2 + 9x + 21$ and $h(x) = 2(x + 5)^2$, which is an equivalent form of $h(x) - g(x)$?

A. $-x^2 - 11x - 29$

C. $x + 4$

(B) $x^2 + 11x + 29$

D. $x^2 + 7x + 11$

$2(x^2 + 10x + 25) - (x^2 + 9x + 21)$

$2x^2 + 20x + 50 - (x^2 + 9x + 21)$

$x^2 + 11x + 29$

What is the value of $f[g(6)]$ if $f(x) = 2x + 4$ and $g(x) = x^2 + 5$

A. 38

(B) 86

C. 43

D. 261

E. 57

$6^2 + 5 = 41$
 $2(41) + 4 =$

4. If $f(x) = 3x^2 + 2x - 1$, find the value of $f(-3)$

A. -12

B. -3

C. 9

(D) 20

$3(-3)^2 + 2(-3) - 1$
 $3(9) - 6 - 1$
 $27 - 6 - 1$

5. Which expression is equivalent to:

$\frac{2}{3}(4m - 5n) + \frac{1}{5}(2m + n)$

$\frac{8}{3}m - \frac{10}{3}n + \frac{2}{5}m + \frac{n}{5} =$

(A) $\frac{46}{15}m - \frac{47}{15}n$

B. $46m - 47n$

C. $-\frac{mn}{15}$

D. $\frac{5}{4}m - \frac{9}{8}n$

$\frac{46}{15}m - \frac{47}{15}n$

6. Find the equation of a line that has a slope of -2 and a y-intercept of $-\frac{3}{4}$

A. $8x - 4y = 3$

(C) $8x + 4y = -3$

$y = -2x - \frac{3}{4}$

B. $-8x + 3y = -4$

D. $3x + 8y = -3$

$4(2x + y = -\frac{3}{4})$

$8x + 4y = -3$

7.

Which expression represents $f(g(x))$ if $f(x) = x^2 - 1$ and $g(x) = x + 3$?

- A $x^3 + 3x^2 - x - 3$
- B $x^2 + 6x + 8$ $(x+3)^2 - 1$
- C $x^2 + x + 2$ $x^2 + 6x + 9 - 1$
- D $x^2 + 8$

9. Solve: $|5d - 8| = 28$

- A. $\frac{36}{5}$ or 4
- B. $\frac{36}{5}$
- C. -4
- D. $\frac{36}{5}$ or -4

$5d - 8 = 28$ $5d - 8 = -28$ $5d = -20$
 $+8$ $+8$ $d = -4$
 $5d = 36$ $d = \frac{36}{5}$

10. Which of the following is a simplified form of the expression $\log_{21} 5 + \log_{21} 4 - \log_{21} 2$?

- A $\log_{21} 10$
 - B $\log_{10} 21$
 - C $\log_{21} 7$
 - D $\log_7 21$
- $\log_{21} \frac{5 \cdot 4}{2}$
 $= \log_{21} 10$

8.

What is the value of $\log_3 27$?

- A 2
- B 3 $3^3 = 27$
- C 6
- D 9

11.

A certain radioactive element decays over time according to the equation $y = A \left(\frac{1}{2}\right)^{\frac{t}{300}}$, where A = the number of grams present initially and t = time in years. If 1000 grams were present initially, how many grams will remain after 900 years?

- A 500 grams
 - B 250 grams
 - C 125 grams
 - D 62.5 grams
- $y = 1000 \left(\frac{1}{2}\right)^{\frac{900}{300}}$

Which equation is equivalent to $\log_3 \frac{1}{9} = x$?

- 13. A $\frac{1}{9} = x^3$
 - B $\left(\frac{1}{9}\right)^3 = x$
 - C $3^x = \frac{1}{9}$
 - D $3^{\frac{1}{9}} = x$
- $3^x = \frac{1}{9}$

14. What are the x-intercepts of the graph of $y = 12x^2 - 5x - 2$?

- A 1 and $-\frac{1}{6}$
 - B -1 and $\frac{1}{6}$
 - C $\frac{2}{3}$ and $-\frac{1}{4}$
 - D $-\frac{2}{3}$ and $\frac{1}{4}$
- $12x^2 - 5x - 2$
 $(4x+3)(3x-2) = 0$
 $x = -\frac{3}{4}$ $x = \frac{2}{3}$

15. Which ordered pair is the vertex of $f(x) = x^2 + 6x + 5$?

(A) $(-3, -4)$ $x = -\frac{b}{2a} = \frac{-6}{2(1)} = -3$
 B $(-2, -3)$
 C $(-1, 0)$ $(-3)^2 + 6(-3) + 5$
 $9 - 18 + 5 = -4$
 D $(0, -5)$
 $(-3, -4)$

16. What are the solutions to the equation $x^2 - 6x + 5 = -8$?

A 2 and 3 $x^2 - 6x + 13 = 0$
 B $2i$ and $3i$ $-13 -13$
 C $3 + 2 \cdot 3$ and $3 - 2 \cdot 3$ $x^2 - 6x + \frac{9}{4} = -13 + \frac{9}{4}$
 (D) $3 + 2i$ and $3 - 2i$ $\sqrt{(x-3)^2} = \sqrt{-4}$
 $x-3 = \pm 2i$
 $+3 +3$
 $x = 3 \pm 2i$

17. What is an equation for a line that has a slope of 3 and passes through $(-2, -4)$?

A) $y = 3x + 10$ B) $y = 3x - 10$
 C) $y = 2x + 3$ (D) $y = 3x + 2$
 $-4 = 3(-2) + b$
 $-4 = -6 + b$ $b = 2$ $y = 3x + 2$
 $+6 +6$

18. What is an equivalent form of $\frac{2}{3+i}$? $\frac{3-i}{3-i}$

A $\frac{3-i}{4}$ $\frac{6-2i}{9-3i+3i-i^2}$
 (B) $\frac{3-i}{5}$ $= \frac{6-2i}{10}$
 C $\frac{4-i}{4}$ $= \frac{8-i}{5}$
 D $\frac{4-i}{5}$

19. What is the sum of the complex numbers $(12 - 5i)$ and $(-3 + 4i)$?

(A) $9 - i$
 B $15 - 9i$
 C $-16 + 63i$
 D $9 - 9i$

20. $\frac{4(x+y)}{5x^2y^3} \div \frac{-2x-2y}{10} =$

(A) $\frac{4}{x^2y^3}$ $\frac{-2y(x+y)}{5x^2y^3} \cdot \frac{10}{-2}$
 B $\frac{4}{x^2y^3}$ $\frac{2y(x+y)}{5x^2y^3} \cdot \frac{10}{-2}$
 C $\frac{4(x+y)}{x^2y^3(x-y)}$ $\frac{-4}{x^2y^3}$
 D $\frac{4(x+y)^2}{5x^2y^3}$

- 21.

What are the solutions to the equation $x^2 + 2x + 2 = 0$?

A $x=0; x=-2$ $x^2 + 2x + \frac{1}{4} = -2 + \frac{1}{4}$
 B $x=0; x=-2i$ $(x+1)^2 = -1$
 (C) $x=-1+i; x=-1-i$ $x+1 = \pm i$
 D $x=-1+2\sqrt{2}; x=-1-2\sqrt{2}$ $x = -1 \pm i$

22. Which expression represents $(-3 - 2i) - (-5 + i)$?

A $-8 - 3i$
 B $-8 - i$
 C $2 - i$
 (D) $2 - 3i$

23. What is $\frac{20x^{-4}}{27y^2} \div \frac{8x^{-3}}{15y^{-5}}$?

- A $\frac{32y^3}{81x}$
- B $\frac{32}{81xy^7}$ $\frac{20}{27x^4y^2} \div \frac{8y^5}{15x^3}$
- C $\frac{25y^3}{18x}$ $\frac{5 \cdot 20}{27x^4y^2} \cdot \frac{5}{15x^3}$
- D** $\frac{25}{18xy^7}$ $\frac{25}{9} \cdot \frac{5}{2}$
- $\frac{25}{18xy^7}$

24. $\frac{2x^2 - 10x}{x^2 + 8x + 16} \cdot \frac{4x + 16}{x^2 - 25} =$

- A $\frac{8x}{(x+4)(x-5)}$ $\frac{2x(x-5)}{(x+4)^2} \cdot \frac{4(x+4)}{(x-5)(x+5)}$
- B $\frac{2x+4}{(x+4)(x+5)}$
- C** $\frac{8x}{(x+4)(x+5)}$ $\frac{8x}{(x+4)(x+5)}$
- D $\frac{2x+4}{x^2+20}$

25. $\frac{x^2 + 4x}{x+3} \cdot \frac{x^2 - 9}{x^2 + x - 12} =$

- A 1 $\frac{x(x+4)}{x+3} \cdot \frac{(x+3)(x-3)}{(x+4)(x-3)}$
- B** x
- C x+4
- D $\frac{x+3}{x-3}$

26. What is the simplest form of $\frac{5x^3y + 20x^2y^2 + 20xy^3}{5xy}$?

- A $(x+2)^2$ $x + 4xy + 4y^2$
- B** $(x+2y)^2$
- C $x^2 + y^2$
- D $x^2 + 4y^2$

28. Which is a simplified form of $\frac{3a^2b^3c^{-2}}{(a^{-1}b^2c)^3}$?

- A** $\frac{3a^5}{b^3c^5}$ $\frac{3a^2b^3c^{-2}}{a^{-3}b^6c^3} = \frac{3a^2a^3b^3}{b^6c^2c^3}$
- B $\frac{3ab}{c^5}$ $= \frac{3a^5}{b^3c^5}$
- C $\frac{3}{b^2c^5}$
- D $\frac{3}{ab^3c^5}$

27. $\frac{x+3}{x+5} + \frac{6}{x^2+3x-10} =$

- A** $\frac{x^2+x}{x^2+3x-10}$
- B $\frac{7x-9}{x^2+3x-10}$ $\frac{(x+3)(x-2)}{(x+5)(x-2)} + \frac{6}{(x+5)(x-2)}$
- C $\frac{x^2+x+12}{x^2+3x-10}$ $\frac{x^2+x-6+6}{(x+5)(x-2)}$
- D $\frac{x^2+x+1}{x^2+3x-10}$

	$5x^3$	$-2x$
$3x^2$	$15x^5$	$-6x^3$
x	$5x^4$	$-2x^2$
-8	$-40x^5$	$+16x$

$16x^5 + 5x^4 - 46x^3 - 2x^2 + 16x - 8$

30. What is $(5x^3 - 2x)(3x^2 + x - 8)$?

- A $5x^3 + 3x^2 - x - 8$
- B $15x^5 - x^4 - 42x^3 + 16x$
- C** $15x^5 + 5x^4 - 46x^3 - 2x^2 + 16x$
- D $15x^6 - 35x^3 - 6x^2 + 14x$

38. Simplify: $(9\sqrt{5} - \sqrt{2})(\sqrt{5} + 3\sqrt{2})$

- a. $26\sqrt{10} + 39$
- b. $27\sqrt{10} + 43$
- c. $9\sqrt{5} - \sqrt{2} + 26\sqrt{10}$
- d. $26\sqrt{10} + 47$
- e. $28\sqrt{10} + 43$

$$9 \cdot 5 + 27\sqrt{10} - \sqrt{10} - 8 \cdot 2$$

$$45 + 26\sqrt{10} - 6$$

$$39 + 26\sqrt{10}$$

$$\left(\frac{5^3 x^3}{-2^3 x^6 y^3}\right) \left(\frac{4^1 x^1}{x^2 y^1}\right)$$

$$= \frac{500x^4}{-8x^9y^4} = \boxed{\frac{-125}{2x^5y^4}}$$

40. Rationalize the denominator and simplify.

$$\frac{4+\sqrt{6}}{4-\sqrt{2}} \cdot \frac{4+\sqrt{2}}{4+\sqrt{2}} = \frac{16 + 4\sqrt{2} + 4\sqrt{6} + \sqrt{12}}{16 + 4\sqrt{2} - 4\sqrt{2} - 2}$$

$$= \frac{16 + 4\sqrt{2} + 4\sqrt{6} + 2\sqrt{3}}{14}$$

$$= \frac{14}{14} + \frac{2\sqrt{2}}{7} + \frac{2\sqrt{6}}{7} + \frac{\sqrt{3}}{7}$$

41. Factor the following COMPLETELY.

A. $125x^3 - 64y^6$

$$(5x - 4y^2)(25x^2 + 20xy^2 + 16y^4)$$

B. $a^3 - 3a^2 - 9a + 27$

$$a(a^2 - 9) - 3(a^2 - 9)$$

$$(a-3)(a^2 - 9)$$

$$(a-3)(a-3)(a+3)$$

$$\text{or } (a-3)^2(a+3)$$

Simplify the following:

42. $\frac{-6g}{\sqrt{18g^2}} \cdot \frac{\sqrt{18g^2}}{\sqrt{18g^2}} = \frac{-6g\sqrt{18g^2}}{18g^2}$

$$= \frac{-6g^2 \cdot 3\sqrt{2}}{18g^2} = \boxed{-\sqrt{2}}$$

43. $\left(\frac{-2x^2}{5xy^{-1}}\right)^{-3} \left(\frac{x^2y}{4x}\right)^{-1}$

$$\left(\frac{-2^3 x^{-6}}{5^3 x^{-3} y^3}\right) \left(\frac{x^{-2} y^{-1}}{4^{-1} x^{-1}}\right)$$

44. $\left(\frac{a^{-1/4} b^{5/6}}{49c^{5/3}}\right)^{3/2}$

$$\frac{a^{-3/8} b^{15/4}}{49^{3/2} c^{5/2}} = \frac{b^{15/4}}{343 a^3 c^{5/2}}$$

45. Solve the system of equations:

Solve the system of equations.

$$\begin{array}{r} 3x - 2y - z = 5 \\ 4x - 3y - z = 6 \\ -x + y = -1 \end{array} \quad \begin{array}{r} 4x - 5y - z = 6 \\ + x + y + z = -7 \\ \hline 5x - 2y = -1 \end{array}$$

$$2(-x + y = -1) \rightarrow -2x + 2y = -2$$

$$6x - 2y = -1 \quad 5x - 2y = -1$$

$$\frac{8x = -3}{8x = -3} \quad x = -1$$

$$\begin{array}{r} 3x - 2y - z = 5 \\ 4x - 3y - z = 6 \\ x + y + z = -7 \end{array} \quad \begin{array}{r} -(-1) + y = -1 \\ +y = -1 \\ -1 \\ y = -2 \end{array}$$

$$\boxed{(-1, -2, -4)}$$

$$\begin{array}{r} -1 - 2 + z = -7 \\ -3 + z = -7 \\ z = -4 \end{array}$$

or Matrix Calc

46. Find the value of this determinant: $\begin{vmatrix} 3 & 2 \\ 9 & 6 \end{vmatrix}$

$$3 \cdot 6 - (9 \cdot 2) = 18 - 18 = \boxed{0}$$

47. Simplify:

$$\frac{2x+1}{x^2-25} \cdot \frac{2x+1}{x^2-25} \cdot \frac{x-5}{4x^2-1} = \frac{2x+1}{(x-5)(x+5)} \cdot \frac{x-5}{(2x-1)(2x+1)}$$

$$= \boxed{\frac{1}{(x+5)(2x-1)}}$$

48. Simplify: $6\sqrt[3]{-56x^8y^7z^6}$

$$6 \cdot 2x^2y^2z^2 \sqrt[3]{7x^2y} = \boxed{-12x^2y^2z^2 \sqrt[3]{7x^2y}}$$

49. Solve $\log_7 x + \log_7 2 = \log_7(x+6)$.

$$2x = x+6$$

$$-x = 6$$

$$\boxed{x = -6}$$

50. Write $\log_b N = k$ in exponential form $b^k = N$

A) $b^N = k$

B) $k^b = N$

C) $N^b = k$

D) $b^k = N$

51. An \$18,000 car depreciates at a rate of 16% per year. How old will the car be when it is worth \$12,000? Use $A = P(1 - r)^t$

A) 0.2 year

B) 2.3 years

C) 2.6 years

D) 3 years

$$\frac{12000}{18000} = \frac{18000}{18000} (1 - 0.16)^t$$

$$\frac{2}{3} = 0.84^t$$

$$\frac{\log \frac{2}{3}}{\log 0.84} = \frac{t \log 0.84}{\log 0.84}$$

$$t = 2.33$$

For the function: $f(x) = -4x^4 + 3x - 4x^2 + 7x + 9x^5$

52. What is the Degree: 5

53. What is the Leading Coefficient: 9

54. What is the End Behavior (using arrows): ↘ ↗

55. Two roots of the equation $x^4 + x^3 - 5x^2 + x - 6 = 0$ are $x=2$ and $x=-3$. Find the remaining roots. And list all of the zero.

$$\begin{array}{r} 2 \mid 1 \quad 1 \quad -5 \quad 1 \quad -6 \\ \quad 2 \quad 6 \quad 2 \quad 6 \\ \hline 1 \quad 3 \quad 1 \quad 3 \quad 0 \end{array}$$

$$x^3 + 3x^2 + x + 3$$

$$\begin{array}{r} -3 \mid 1 \quad 3 \quad 1 \quad 3 \\ \quad -3 \quad 0 \quad -3 \\ \hline 1 \quad 0 \quad 1 \quad 0 \\ \quad \quad \quad x^2 + 1 \end{array}$$

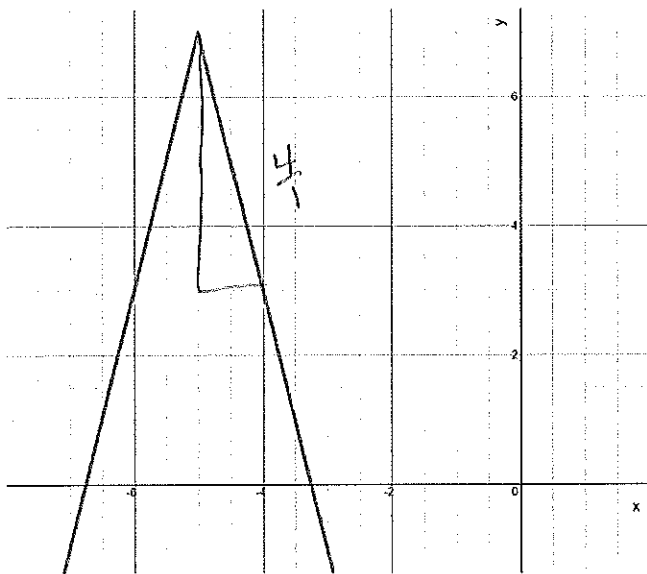
$$x^2 + 1 = 0$$

$$x^2 = -1$$

$$x = \pm i$$

$$\boxed{x = 2, -3, i, -i}$$

56. Describe the transformations from the parent function.



x-axis reflection

left 5

up 7

compressed

$$y = -4|x + 5| + 7$$

