KEY

Directions: Choose the answer choice that best answers the question.

1. Which expression is equivalent to $(5x^6 - 2x^4 + 3x) + (-7x^6 + 8x^4 - 2x)$?
   a. $-x^6 + 6x^4 + x$
   b. $-2x^6 + 6x^4 + x$
   c. $-x^6 + 6x^4 + 5x$
   d. $-x^6 + 10x^4 + x$

$-2x^6 + 6x^4 + x$

2. What value of k makes x-2 a factor of $x^3 + 6x^2 - x + k$?
   a. -30
   b. -15
   c. 15
   d. 30

$(2)^3 + 6(2)^2 - 2 + k = 0$
$8 + 24 - 2 + k = 0$
$30 + k = 0$
$-30 \quad -30$
$k = -30$

3. What is the solution to the equation below?

$$\frac{\frac{4}{x} + 5}{\frac{x}{6} + 3} = \frac{24}{x}$$

   a. -68
   b. -20
   c. 20
   d. 68

4. A circle that has an equation of $(x-4)^2 + (y+7)^2 = 36$ is translated 5 units to the right and 7 units down. Its radius is doubled. What is the equation of the new, larger circle?
   a. $(x-9)^2 + (y)^2 = 144$
   b. $(x+1)^2 + (y)^2 = 72$
   c. $(x-9)^2 + (y+14)^2 = 144$
   d. $(x+1)^2 + (y+14)^2 = 144$

$(4, -7) \rightarrow (9, -14)$
$6 \rightarrow 12$

5. Selena deposits $3000 into an account with an annual interest rate of 8%. If interest is compounded continuously, how long will it take Selena to triple her money?
   a. 9.81 years
   b. 13.73 years
   c. 27.46 years
   d. 100 years

Pe^{rt}
$3000e^{.08t}$

6. Which is the solution set for x if $x^4 - 4x^2 + 3 = 0$?
   a. {1, 3}
   b. $\{\pm 1, \pm\sqrt{3}\}$
   c. $\{\pm 1, \pm 3\}$
   d. {-1, -3}

(exponents)

$x^4 - 4x^2 + 3 = 0$

7. How long will it take Michael to double his money if he invests $5000 at an interest rate of 6% compounded yearly?
   a. 11.90 years
   b. 23.80 years
   c. 56.24 years
   d. 198.26 years

$5000\left(1 + \frac{.06}{1}\right)^{x \cdot 1}$

8. Mary Lynn wants to determine which crosswalk is used the most at a particular intersection during rush hour. Which type of study would be the most practical to obtain this information?
   a. A simulation
   b. An experiment
   c. A survey
   d. An observation

9. What is the fully factored form of $27x^3 + y^3$?
   a. $(3x + y)(3x + y)(3x + y)$
   b. $(3x - y)(9x^2 + 3xy + y^2)$
   c. $(3x - y)(9x^2 + 6xy + y^2)$
   d. $(3x + y)(9x^2 - 3xy + y^2)$

10. What is the value of x if $\frac{m-2}{x} + 11 = 19$?
    a. $x = \frac{m}{4}$
    b. $x = \frac{m}{6}$
    c. $x = \frac{m}{8} - \frac{1}{4}$
    d. $x = \frac{m}{8} + \frac{1}{4}$

$\frac{m-2}{8} = \frac{8x}{8}$

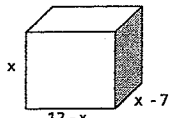
11. Mable drives her Mercury sable 22,000 miles per year and gets 24 miles per gallon. Is she buys a brand new car and gas continues to cost $3.75 a gallon, how many more miles per gallon will she be getting in the new car is she saves approximately $860 per year?
    a. 4
    b. 8
    c. 16
    d. 32

$\frac{22{,}000}{24} \times 3.75 = 4 - 860 \times 3.75$

$2{,}200$

12. What value of h is needed to complete the square for the following equation?
    $x^2 + 6x + h = 16 + h$
    a. 3
    b. 6
    c. 9
    d. 12

13. A right rectangular prism is shown below.



What is the domain for the volume function of the prism?

a. $7 < x < 12$
b. $5 < x < 19$
c. $0 < x < 7$
d. $0 < x < 12$

14. Which point lies in the solution set or the following system?

$2x + y \geq 3$
$x - y \geq 2$

a. (1, 1)
b. (2, -2)
c. (3, 0)
d. (0, 3)

Desmos & find point in both inequalities

15. Find the difference.

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

$(x-2)$ $(x-2)$ $(x+5)$ $(x+5)(x-2)$

$\frac{x^2+x-6}{(x-2)(x+5)} - \frac{6}{(x-2)(x+5)}$

a. $\frac{x^2+x+1}{x^2+3x-10}$
b. $\frac{x^2+x}{x^2+3x-10}$
c. $\frac{x^2+x-12}{x^2+3x-10}$
d. $\frac{x^2+x+12}{x^2+3x-10}$

16. If Marcus is solving the following equation by completing the square, what number should he add to both sides?

$x^2 - 8x = 9$

a. 4
b. 8
c. 16
d. 32

17. Pamela had a parabola with the equation $y = (x + 5)^2 - 10$ and translated it to where its new equation was $y = x^2 - 4x + 8$. What best describes the translation?

a. The parabola was moved to the left 7 and down 14.
b. The parabola was moved to the left 7 and up 14.
c. The parabola was moved to the right 7 and down 14.
d. The parabola was moved to the right 7 and up 14.

18. Which is the inverse of $f(x) = 5.5^x - 6$?

a. $\frac{x+6}{5.5}$
b. $\frac{\log(x)+\log(6)}{\log(5.5)}$
c. $\frac{\log(x)+6}{\log(5.5)}$
d. $\frac{\log(x+6)}{\log(5.5)}$

$x = 5.5^y - 6$

$\log x + 6 = y \log 5.5$

20. If $x^2 - 4x - 32$ is written in the form $a(x - h) + k$, what is the value of $a + h + k$?

a. -39
b. -33
c. 33
d. 39

-4

$1(x-2)^2 - 36$

$a = 1$
$b = 2$
$c = -36$

$1 + 2 - 36$

21. The volume of a rectangular prism is represented by the expression $(x^3 + 6x^2 - 36x + 40)$. If the length is $(x + 10)$ and the height and width are the same, what is the width of the prism?

a. $x + 2$
b. $x - 2$
c. $x + 4$
d. $x - 4$

$x + 10$

$x^2 - 4x + 4$

$(x-2)(x-2)$

$x^2 - 4x + 4$

$x+10 \;\overline{)\; x^3 + 6x^2 - 36x + 40}$

$-x^3 - 10x^2$

$-4x^2 - 36x$

$+4x^2 + 40x$

$4x + 40$

$-4x - 40$

0

22. Which expression is equivalent to $\left(\frac{a^{\frac{-1}{5}}b^{-6}}{16a^{\frac{4}{5}}b^{6}}\right)^{\frac{3}{2}}$?

a. $\frac{1}{125ab^{12}}$

b. $\frac{1}{125a^{\frac{3}{2}}b^{18}}$

c. $125a^{\frac{3}{2}}b^{18}$

d. $125a\,b^{12}$

$$\left(\frac{1}{16a\,b^{12}}\right)^{\frac{3}{2}}$$

$$\frac{1}{64a^{\frac{3}{2}}b^{18}}$$

25. What is the value of the expression $(a^2 + b^2)$ if a and b are distinct solution of the equation $x^2 + 12x - 64 = 0$?

a. -256

b. -12

c. 260

d. 272

16 + 256

$a = 4$ $b = -16$

$(4)^2 + (-16)^2$

26. Which graph below shows $y = x^2 + 3x - 18$ when it is translated to the right 2 and up 4?

a. $y = (x + 1)^2 - 23$

b. $y = (x - 1)^2 - 31$

c. $y = (x + 5)^2 - 23$

d. $y = (x + 5)^2 - 31$

$y = (x + 1.5)^2 - 20.25$

$\rightarrow 2 \quad \uparrow 4$

$y = (x - .5)^2 - 16.25$

31. Write the following product in its simplest, factored form.

$$\frac{x^2-9x+8}{x^2+9x+8} \times \frac{x+8}{8x-8}$$

a. $\frac{-(x+8)}{8x-8}$

b. $\frac{x-8}{8(x+1)}$

c. $\frac{x-8}{8(x-1)}$

d. $\frac{x-1}{8(x+1)}$

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

34. What are the domain and range of the function $y = -|x-8| + 3$?

a. D: {all real numbers ≠ 8}
   R: {all real numbers less than or equal to 3}

b. D: {all real numbers}
   R: {all real numbers less than or equal to 3}

c. D: {all real numbers ≠8}
   R: {all real numbers greater than or equal to 3}

d. D: {all real numbers}
   R: {all real numbers greater than or equal to 3}

38. If -3 is one of the roots of the function $y = x^3 + 3x^2 - 16x - 48$, what are the two other roots?

a. x = -2, 2

b. x = -1, 1

c. x = -4, 4

d. x = 4

$x^2 - 16 \quad x+3$

$(x+4)(x-4)$

$x=-4 \quad x=4$

$x^3 + 0x^2 - 16$

$x^3 + 3x^2 - 16x - 48$

$-x^3 - 3x^2 \downarrow$

$-16x - 48$

$+16x + 48$

0

39. Which function does not have an inverse?

a. $f(x) = -5x + 9$

b. $f(x) = -8x^2 - 36$

c. $f(x) = \sqrt{-x} + 12$

d. $f(x) = \sqrt{-4x + 13}$

40. A system of equations is given below. What is the solution to this system?

$2x + y - 3x = -8$

$x - 4y + 5z = -13$

$x + y + z = -3$

a. x = -20
   y = 29
   z = -24

b. x = 232
   y = 377
   z = 87

c. x = -32
   y = 41
   z = -44

d. x = -5
   y = 2
   z = 0

43. What is the solution to the polynomial system below?

$$\begin{cases} x^2 + y^2 = 25 \\ 4x^2 + 25y^2 = 100 \end{cases}$$

a. (-5, 0)
b. (0, 5)
c. {0}
d. (0, ±5)

$x = \sqrt{5y - 2}$

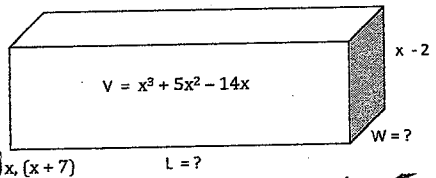
44. What is the inverse of $g(x) = \sqrt{5x - 2} + 1$, *for all* $x \geq \frac{2}{5}$?

a. $g^{-1}(x) = \frac{(x-1)^2 + 2}{5}$
b. $g^{-1}(x) = \frac{(x-1)^2}{5} + 2$
c. $g^{-1}(x) = \frac{(x+1)^2 - 2}{5}$
d. $g^{-1}(x) = \frac{(x+1)^2}{5} - 2$

$(x-1)^2 = 5y - 2$

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

45. The volume of the box below is $x^3 + 5x^2 - 14x$. The height is $x - 2$. What are the dimensions of the length and width?



a. x, (x + 7)
b. x^2, 7x
c. (x + 7), (x + 1)
d. x, 7

2	1	5	-14	0
	↓	2	14	↓
	1	7	0	0
	x²	x	C	R

$x^2 + 7x$

47. Solve.

$\frac{(x+5)}{(x+5)}\frac{x+4}{x+2} + \frac{x+6}{x+5} = \frac{2}{(x+2)}\frac{(x+5)(x+2)}{(x+5)(x+2)}$

$x^2 + 7x + 10$

a. x = -4
b. x = -1
c. x = 1
d. x = 4

48. What is the largest possible solution of
$g(x) = -\sqrt{x-4} + 3$, *from its parent function* $f(x) = \sqrt{x}$?

a. Left 4, Reflect over x, Down 3
b. Right 4, reflect over x, Down 3
c. Left 4, Reflect over x, Up 3
d. Right 4, Reflect over x, Up 3

$x^2 + 9x + 20 + x^2 + 8x + 12 = 2x^2 + 14x + 20$

$2x^2 + 17x + 32 = 2x^2 + 14x + 20$
$-14x \quad -32 \quad -14x \quad -32$

$\frac{3x}{3} = \frac{-12}{3}$

$x = -4$