

Part I: Select the letter of the correct response.

1. What are the zeros of the function $f(x) = x^2 - 5x - 6$?

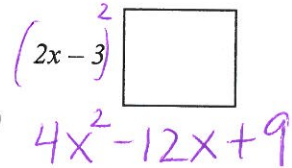
- (a) {6, -1} (b) {-6, 1} (c) {-2, -3} (d) {2, -3}

$$\frac{(x-6)(x+1)}{x-6=0 \quad x+1=0} = 0$$

$x = \{-1, 6\}$

2. Which expression represents the area of the square shown?

- (a) $4x^2 - 9$ (b) $8x - 12$ (c) $4x^2 - 12x + 9$ (d) $4x^2 - 6x - 9$

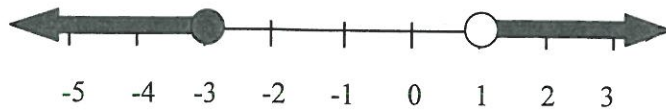


3. A taxi ride costs \$2.50 for the first mile and \$0.75 for each additional half-mile. If x represents the number of additional miles ridden, which function accurately represents the cost of a ride in this taxi?

- (a) $C(x) = 2.50 + 0.75(2x)$ (c) $C(x) = 2.50 + 0.75(x + \frac{1}{2})$
 (b) $C(x) = 2.50 + 0.75(\frac{1}{2}x)$ (d) $C(x) = 2.50 + 0.75(2x - 1)$

*Since \$.75 is the cost for half an additional mile we do $.75(2x)$ for the cost of each additional miles

4. Which is the correct representation, in interval form, of the inequality shown in the graph below?



- (a) $(-\infty, -3] \cap (1, \infty)$ (b) $(-\infty, -3] \cup (1, \infty)$ (c) $[-3, 1)$ (d) $(-3, 1]$

5. What is the domain of $f(x) = \sqrt{x+4}$?

- (a) $x \geq 4$ (b) $x \geq -4$ (c) $x \geq 0$ (d) $x \leq -4$

$$x+4 \geq 0$$

6. What point lies on the boundary line of $2x - 6y < 24$?

- (a) (2, 6) (b) (0, 0) (c) (-2, -6) (d) (6, -2)

$$y > \frac{1}{3}x - 4$$

x	y
-2	$-4\frac{2}{3}$
0	-4
2	$-3\frac{1}{3}$
6	-2

7. Which could not represent the lengths of the sides of a right triangle?

$$(leg)^2 + (leg)^2 = (hyp)^2$$

- (a) 6, 9, 12 (b) 9, 12, 15 (c) 5, 13, 12 (d) $\sqrt{6}, \sqrt{6}, \sqrt{12}$
- $6^2 + 9^2 = 12^2$ $9^2 + 12^2 = 15^2$ $5^2 + 12^2 = 13^2$ $(\sqrt{6})^2 + (\sqrt{6})^2 = (\sqrt{12})^2$
 $36 + 81 \neq 144$ $81 + 144 = 225$ ✓ $25 + 144 = 169$ ✓ $6 + 6 = 12$ ✓

8. Which data set has the greatest variability from the center, as measured by its interquartile range?

- (a) 3, 4, 8, 8, 10, 12, 15 (c) 17, 18, 19, 20, 21, 22, 23 (d) 20, 20, 20, 30, 30, 30, 30
- $IQR = 8$ $IQR = 4$ $IQR = 10$

9. Joe bought a car 6 years ago for \$24,000. It has been depreciating at a rate of 19% per year. Which expression represents its current value?

$$A = 24000(1 - .19)^6$$

- (a) $24,000(0.81)^6$ (b) $24,000(1.19)^6$ (c) $24,000(0.19)^6$ (d) $24,000(\frac{0.81}{6})$

Any term = two (value of) + 4
the previous term

10. Which of the following represents the sequence -3, -2, 0, 4, 12, 28?

- (a) $a(n) = a(n-1)^2 + 4$ (b) $a(n) = 2 \cdot a(n-1) + 4$ (c) $a(n) = a(n-1) + (n+1)$ (d) $a(n) = 2 \cdot a(n-1) - 4$

ex.) $a(1) = 2(0) + 4$ $a(1) = 4$

11. What is the difference when $(2x^3 - 9x^2 + x - 4)$ is subtracted from $(x^3 - 6x^2 + 2)$?

- (a) $x^3 - 3x^2 + x - 6$ (b) $x^3 - 15x^2 + x - 2$ (c) $-x^3 + 3x^2 - x + 6$ (d) $-x^3 - 15x^2 + x - 2$

$$x^3 - 6x^2 + 2 - 2x^3 + 9x^2 - x + 4$$

$$-x^3 + 3x^2 - x + 6$$

12. What is the equation of a line perpendicular to $x + 3y = 6$ and passing through the point $(0, -4)$?

- (a) $y = \frac{1}{3}x - 4$ (b) $y = -\frac{1}{3}x - 4$ (c) $y = 3x - 4$ (d) $-4y = 3x$

$$y = -\frac{1}{3}x + 2 \quad m \perp = 3$$

y-intercept
 $b = -4$

13. Which of the following functions is quadratic?

(common 2nd difference)

(a)

x	y
-2	-5
-1	-3
0	-1
1	1

Linear

(b)

x	y
0	1
1	2
2	5
3	10

Quadratic

(c)

x	y
0	0
1	4
4	16
9	36

Exponential

(d)

x	y
-1	$\frac{1}{2}$
0	1
1	2
2	4

Exponential

14. Which of the following represents an upward vertical shift of the parent function: $y = |x|$?

- (a) $y = |x| + 2$ (b) $y = 2|x|$ (c) $y = |x + 2|$ (d) $y = |x - 2|$

15. What is the value of $f(-1)$ for the function defined as follows?

$$f(x) = \begin{cases} x + 5, & x \leq -3 \\ 2x, & -3 < x < 1 \\ x - 4, & x \geq 1 \end{cases}$$

$$f(-1) = 2(-1) = -2$$

- (a) 4 (b) -2 (c) -5 (d) It is undefined.

16. Two hot dogs and a soda cost \$3.50. Three hot dogs and 2 sodas cost \$5.75. What is the cost of a hot dog?

- (a) \$1.00 (b) \$1.25 (c) \$1.50 (d) \$2.50

$$\begin{aligned} 2h + s &= 3.50 \\ 3h + 2s &= 5.75 \end{aligned}$$

Discriminant: $b^2 - 4ac$

17. Which correctly describes the number and nature of the roots of $-x^2 - 8x + 10 = 0$?

- (a) No real roots (b) One rational root (c) Two rational roots (d) Two irrational roots

$$\begin{aligned} -4h - 2s &= -7 \\ +3h + 2s &= 5.75 \\ \hline -h &= -1.25 \end{aligned}$$

18. Which is an example of bivariate data?

- (a) heights of all the boys in the 8th grade
(b) grades received on a math and a science test for one class of students
(c) ages of people at a conference
(d) favorite flavor of ice cream for all students in the school

$$\begin{aligned} a &= -1 \\ b &= -8 \\ c &= 10 \\ (-8)^2 - 4(-1)(10) \\ 64 + 40 \\ 104 \end{aligned}$$

Part II: Show work for each of the following questions.

$$x = \frac{d+b}{a-c}$$

1. Solve for x in the equation: $ax - b = cx + d$

$$\begin{aligned} ax - b &= cx + d \\ -cx + b & \quad -cx + b \\ \hline ax - cx &= d + b \\ x(a-c) &= \frac{d+b}{a-c} \end{aligned}$$

2. Solve the inequality and graph the solution set on the number line: $|2x - 3| + 4 < 9$

$$\begin{aligned} 2x - 3 < 5 \quad \text{and} \quad 2x - 3 > -5 \\ +3 \quad +3 \quad \quad \quad +3 \quad +3 \\ \hline 2x < 8 \quad \text{and} \quad 2x > -2 \\ \frac{2x}{2} < \frac{8}{2} \quad \text{and} \quad \frac{2x}{2} > \frac{-2}{2} \\ x < 4 \quad \text{and} \quad x > -1 \end{aligned}$$



$$-1 < x < 4$$

3. Factor completely: $8x^3 + 4x^2 - 24x$

$$\begin{aligned} 4x(2x^2 + x - 6) \\ 4x(2x - 3)(x + 2) \end{aligned}$$

4. Simplify: $\frac{(-4x^2y)(2xy^3)^3}{16x^6y^4}$

(only positive exponents in the answer)

$$\frac{(-4x^2y)(8x^3y^9)}{16x^6y^4} \rightarrow \frac{-32x^5y^{10}}{16x^6y^4} \rightarrow \frac{-2y^6}{x}$$

5. A football is thrown across a field. Its height (in feet) from the ground after t seconds is modeled by the equation:

$$h(t) = -16t^2 + 40t + 4 \leftarrow y\text{-intercept}$$

(a) What is the significance of the constant in the equation above?

the ball starts 4ft above ground.

(b) What is the maximum height that the football will reach?

$$\begin{aligned} x &= \frac{-b}{2a} \\ x &= \frac{-40}{2(-16)} \\ x &= \frac{-40}{-32} = \frac{5}{4} = 1.25 \end{aligned}$$

The Max Height is 29ft

$$h\left(\frac{5}{4}\right) = -16\left(\frac{5}{4}\right)^2 + 40\left(\frac{5}{4}\right) + 4$$

$$h\left(\frac{5}{4}\right) = -16\left(\frac{25}{16}\right) + 50 + 4$$

$$h\left(\frac{5}{4}\right) = -25 + 50 + 4$$

$$h\left(\frac{5}{4}\right) = 29$$

$$\left(\frac{5}{4}, 29\right)$$

(c) Assuming that the football goes across the field with no one catching or stopping it, how long will it take till it reaches the ground?

$$y \text{ height} = 0$$

$$x = 2.6 \text{ sec}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = -16$$

$$b = 40$$

$$c = 4$$

$$0 = \frac{-40 \pm \sqrt{(40)^2 - 4(-16)(4)}}{2(-16)}$$

$$0 = \frac{-40 \pm \sqrt{1600 + 256}}{-32} \rightarrow 0 = \frac{-40 \pm \sqrt{1856}}{-32}$$

6. Given $y = ax^2 - 8x + 12$, with axis of symmetry $x = -2$, find the value of a . → max/min x-value

$$x = \frac{-b}{2a} \quad -2 = \frac{8}{2a} \quad -4a = \frac{8}{-4}$$

7. Solve the equation for x : $\frac{5}{x} - 4 = \frac{2}{3} + \frac{8}{3x}$

$$a = -2$$

$$15 - 12x = 2x + 8$$

$$7 = 14x$$

$$x = \frac{1}{2}$$

8. Draw a dot plot for the following data set. Calculate its mean and standard deviation.

80, 85, 85, 85, 88, 90, 93, 93, 95, 96

$$\bar{x} = \frac{\text{Sum of data}}{\# \text{ of data}} = \frac{890}{10} = 89 \text{ mean}$$

$$s_x = \sqrt{\frac{\sum |x - \bar{x}|^2}{n-1}}$$

$x - \bar{x}$	$ x - \bar{x} $	$ x - \bar{x} ^2$
80 - 89 = -9	9	81
85 - 89 = -4	4	16
85 - 89 = -4	4	16
85 - 89 = -4	4	16
88 - 89 = -1	1	1
90 - 89 = 1	1	1
93 - 89 = 4	4	16
93 - 89 = 4	4	16
95 - 89 = 6	6	36
96 - 89 = 7	7	49

$$\sum |x - \bar{x}|^2 = 248$$

$$(n-1) = 10-1 = 9$$

$$\sqrt{\frac{248}{9}}$$

$$\sqrt{27.5}$$

$$s_x \approx 5.2$$

9. (a) Graph the functions on the same set of axes: $f(x) = 4 \cdot \left(\frac{1}{2}\right)^x$ and $g(x) = 2x - 3$.

(b) Using your graph, state the coordinates of a point that satisfies the equation: $4 \cdot \left(\frac{1}{2}\right)^x = 2x - 3$

$$f(x) = 4 \left(\frac{1}{2}\right)^x$$

$$g(x) = 2x - 3$$

x	f(x)
-4	64
-3	32
-2	16
-1	8
0	4
1	2
2	1
3	$\frac{1}{2}$

x	g(x)
-4	-11
-3	-9
-2	-7
-1	-5
0	-3
1	-1
2	1
3	3
4	5

$$b) (2, 1)$$

