

Pre-Calc 11 Term 1 Pre-test

Multiple Choice

Identify the choice that best completes the statement or answers the question.

Note: Questions #1-12 are non-calculator!!

- _____ 1. What is the distance between -18.1 and 9.7 on a number line?
A. 13.9 B. 27.8 C. 16.8 D. 8.4
- _____ 2. Evaluate: $\sqrt{(-9 - (-17))^2}$
A. 26 B. 2.83 C. 8 D. 64
- _____ 3. Evaluate: $|-11 + (-1)| - 7|7 - (21)|$
A. -86 B. -208 C. 266 D. -206
- _____ 4. Evaluate $|(-3)x^3 - (9)x - (3)|$ when $x = 3$.
A. 108 B. 111 C. 87 D. 81
- _____ 5. Write this mixed radical as an entire radical: $-7\sqrt{2}$
A. $\sqrt{98}$ B. $\sqrt{-14}$ C. $-\sqrt{98}$ D. $\sqrt{196}$
- _____ 6. Write this mixed radical as an entire radical: $-\frac{4}{3}\sqrt[3]{\frac{5}{6}}$
A. $\sqrt[3]{-\frac{160}{41}}$ B. $\sqrt[3]{-\frac{160}{81}}$ C. $\sqrt[3]{\frac{81}{160}}$ D. $\sqrt[3]{41}$
- _____ 7. Write this entire radical as a mixed radical: $\sqrt{150}$
A. $10\sqrt{6}$ B. $10\sqrt{12}$ C. $5\sqrt{36}$ D. $5\sqrt{6}$
- _____ 8. Write this entire radical as a mixed radical: $\sqrt[4]{80}$
A. $4\sqrt[4]{10}$ B. $2\sqrt[4]{25}$ C. $2\sqrt[4]{5}$ D. $4\sqrt[4]{5}$
- _____ 9. Write this entire radical as a mixed radical: $\sqrt[3]{-\frac{54}{125}}$
A. $-2\sqrt[3]{\frac{3}{5}}$ B. $\sqrt[3]{-\frac{6}{5}}$ C. $-\frac{5\sqrt[3]{2}}{3}$ D. $-\frac{3\sqrt[3]{2}}{5}$
- _____ 10. For which values of the variable, x , is this radical defined?
 $\sqrt{-38x^3}$
A. $x \leq 0$ C. $x \geq 0$
B. $x \in \mathbb{R}$ D. $x < 0$

- _____ 11. Write this radical in simplest form: $\sqrt{63a^9b^8}$
Then state the values of the variables, a and b , for which the radical is defined.
- A. $3a^4b^4\sqrt{7a}$; $a \in \mathbb{R}, b \geq 0$ C. $3ab\sqrt{7a^4b^4}$; $a \in \mathbb{R}, b \geq 0$
B. $3ab\sqrt{7a^4b^4}$; $a \geq 0, b \in \mathbb{R}$ D. $3a^4b^4\sqrt{7a}$; $a \geq 0, b \in \mathbb{R}$
- _____ 12. For which values of the variable, x , is this radical defined?
 $\sqrt{-22x^4}$
- A. $x \geq 0$ C. $x \leq 0$
B. $x \in \mathbb{R}$ D. the radical is never defined
- _____ 13. Write this radical in simplest form: $\sqrt[4]{\frac{625y^5}{512}}$
Then state the values of the variable, y , for which the radical is defined.
- A. $\frac{5y}{2}\sqrt[4]{\frac{y}{2}}$; $y \geq 0$ C. $\frac{5y}{4}\sqrt[4]{\frac{y}{2}}$; $y \geq 0$
B. $\frac{5y}{4}\sqrt[4]{\frac{1}{2}}$; $y \in \mathbb{R}$ D. $\frac{y}{4}\sqrt[4]{\frac{5y}{2}}$; $y \geq 0$
- _____ 14. Arrange these radicals in order from greatest to least.
- i) $3^3\sqrt{5}$
ii) $\sqrt[3]{375}$
iii) $4^3\sqrt{3}$
iv) $\sqrt[3]{40}$
- A. iv, i, iii, ii C. iii, ii, i, iv
B. ii, iii, i, iv D. ii, iv, i, iii
- _____ 15. Which statement is true?
- i) $\sqrt{-475x^7} = (-5x^3)\sqrt{19x}$; for $x \in \mathbb{R}$
ii) $\sqrt{-475x^7} = 5|x^3|\sqrt{-19x}$; for $x \leq 0$
iii) $\sqrt{-475x^7} = 5|x^3|\sqrt{-19x}$; for $x \geq 0$
iv) There are no values of $x \in \mathbb{R}$ for which $\sqrt{-475x^7} = 5|x^3|\sqrt{-19x}$
- A. ii B. i C. iv D. iii
- _____ 16. Which radical expression simplifies to $9\sqrt{2}$?
- A. $\sqrt{32} - 7\sqrt{2} + \sqrt{8}$ C. $\sqrt{32} + 7\sqrt{8} - \sqrt{2}$
B. $\sqrt{32} - \sqrt{8} + 7\sqrt{2}$ D. $\sqrt{2} + 7\sqrt{8} - \sqrt{32}$
- _____ 17. Which radical expression simplifies to $-9\sqrt{x}$?
- A. $-8\sqrt{x} + 4\sqrt{x} - 5\sqrt{x}, x \geq 0$ C. $-8\sqrt{x} - 4\sqrt{x} + 5\sqrt{x}, x \geq 0$
B. $-8\sqrt{x} + 4\sqrt{x} - 5\sqrt{x}, x \in \mathbb{R}$ D. $-8\sqrt{x} - 4\sqrt{x} + 5\sqrt{x}, x \in \mathbb{R}$
- _____ 18. Simplify by adding or subtracting like terms: $8\sqrt{13} - 7\sqrt{13} + 5\sqrt{13}$
- A. $6\sqrt{13}$ B. $\sqrt{78}$ C. $10\sqrt{13}$ D. $6\sqrt{10}$

- ____ 19. Simplify by adding or subtracting like terms: $\sqrt{243} + 4\sqrt{3} - \sqrt{27}$
 A. $16\sqrt{3}$ B. $8\sqrt{3}$ C. $10\sqrt{3}$ D. 0
- ____ 20. Simplify by adding or subtracting like terms: $\sqrt{729} - \sqrt[3]{8} - \sqrt{81} + \sqrt[3]{512}$
 A. $18 - 6\sqrt[3]{2}$ C. $18\sqrt{3} - 6\sqrt[3]{2}$
 B. $6 - 18\sqrt{3}$ D. 24
- ____ 21. Simplify by adding or subtracting like terms: $\sqrt[3]{729w^4} - 3w\sqrt[3]{w} - \sqrt[3]{27w^7} + 3w^2, w \in \mathbb{R}$
 A. $6w\sqrt[3]{w} - 3w^2\sqrt[3]{w} + 3w^2$ C. $6w\sqrt[3]{w}$
 B. $6w\sqrt[3]{w} + 6w^2$ D. $3w\sqrt[3]{w} + 3w^2$
- ____ 22. Expand and simplify this expression: $\sqrt{3}(\sqrt{2} + 4)$
 A. $3\sqrt{2} + 4\sqrt{3}$ C. $\sqrt{6} + \sqrt{12}$
 B. $2\sqrt{3} + \sqrt{12}$ D. $\sqrt{6} + 4\sqrt{3}$
- ____ 23. Expand and simplify this expression: $(\sqrt{5} + 7)^2$
 A. $54 + 14\sqrt{5}$ C. $5\sqrt{5} + 49$
 B. $5\sqrt{5} + 14\sqrt{5} + 54$ D. $54 + 5\sqrt{14}$
- ____ 24. Rationalize the denominator: $\frac{7}{7\sqrt{5}}$
 A. $\frac{7\sqrt{5}}{35}$ B. $\frac{35\sqrt{5}}{5}$ C. $\frac{7\sqrt{5}}{5}$ D. $\frac{49\sqrt{5}}{7}$
- ____ 25. Expand and simplify this expression: $(-5\sqrt{5} - 2\sqrt{3})(4\sqrt{5} + 8) + 2\sqrt{5}(3\sqrt{5} + 3\sqrt{3})$
 A. $-70 - 58\sqrt{15}$
 B. $-130 - 40\sqrt{5} + 16\sqrt{3} - 2\sqrt{15}$
 C. $-70 - 40\sqrt{5} - 16\sqrt{3} - 2\sqrt{15}$
 D. $-130 - 40\sqrt{5} - 16\sqrt{3} - 14\sqrt{15}$
- ____ 26. Expand and simplify this expression: $(2\sqrt{s} - 7\sqrt{t})(5\sqrt{s} - 7\sqrt{t}), s \geq 0, t \geq 0$
 A. $10s - 49\sqrt{st} + 49t$ C. $10s - 70\sqrt{st} + 49t$
 B. $10s - 28\sqrt{st} + 49t$ D. $-45st - 49\sqrt{st}$
- ____ 27. Simplify this expression: $\frac{-9\sqrt{5} - 3}{\sqrt{5}}$
 A. $\frac{-45 - 3\sqrt{5}}{5}$ C. $\frac{-9 - 15\sqrt{5}}{5}$
 B. $-225 - 3\sqrt{5}$ D. $\frac{-45\sqrt{5} - 15}{5}$

- _____ 28. Simplify this expression: $\frac{2\sqrt{3} + 9\sqrt{7}}{\sqrt{2} - 8}$
- A. $\frac{-2\sqrt{3} - 18\sqrt{42} - 72\sqrt{7}}{-6}$
- B. $\frac{-2\sqrt{6} - 9\sqrt{14} - 16\sqrt{3} - 72\sqrt{7}}{62}$
- C. $\frac{-2\sqrt{3} - 18\sqrt{42} - 72\sqrt{7}}{62}$
- D. $\frac{-2\sqrt{6} - 9\sqrt{14} - 16\sqrt{3} - 72\sqrt{7}}{-6}$
- _____ 29. Simplify this expression: $\frac{\sqrt{7}}{\sqrt{12}} - \left(\frac{-7\sqrt{3}}{\sqrt{28}} \right)$
- A. $\frac{2\sqrt{21}}{3}$ B. $\frac{\sqrt{2}}{3}$ C. $\frac{2\sqrt{21}}{7}$ D. $\frac{21\sqrt{2}}{11}$
- _____ 30. Solve this equation: $9\sqrt{4x} = 72$
- A. $x = 16$ B. $x = 64$ C. $x = \frac{1}{8}$ D. $x = 8$
- _____ 31. Solve this equation: $9\sqrt{x} - 6 = 30$
- A. $x = 4$ B. $x = 16$ C. $x = 9$ D. $x = 8$
- _____ 32. Solve this equation: $\sqrt{-2 + 8x} = \sqrt{-44 + 2x}$
- A. $x = \frac{1}{7}$ B. $x = -5$ C. $x = -6$ D. no real solution
- _____ 33. Solve this equation: $\frac{\sqrt{x}}{3} = 4$
- A. $x = 144$ B. $x = 12$ C. $x = 7$ D. $x = 3$
- _____ 34. Solve this equation: $4\sqrt{2x - 2} = 2\sqrt{5x + 4}$
- A. $x = 4$ B. $x = 8$ C. $x = 2$ D. $x = 16$
- _____ 35. Solve this equation: $5 = \sqrt[3]{5x - 8} + 3$
- A. $x = -8$ B. $x = \frac{32}{5}$ C. $x = 40$ D. $x = 8$
- _____ 36. Factor this polynomial: $120x^2 - 52x - 224$
- A. $(5x + 8)(6x - 7)$ C. $4(5x + 8)(6x + 7)$
- B. $4(5x - 8)(6x + 7)$ D. $(5x - 8)(24x - 28)$

- _____ 37. Factor this polynomial: $\frac{15}{4} - x - x^2$
- A. $\frac{1}{4}(5 - 2x)(3 + 2x)$ C. $\frac{1}{2}(5 + 2x)(3 - 4x)$
 B. $\frac{1}{2}(5 - 2x)(3 + 4x)$ D. $\frac{1}{4}(5 + 2x)(3 - 2x)$
- _____ 38. Factor this polynomial expression: $2(3x - 2)^2 + 9(3x - 2) - 5$
- A. $3(x + 1)(6x - 5)$ C. $2(3x + 2)(x - 5)$
 B. $2(3x - 2)(x + 5)$ D. $3(x - 1)(6x + 5)$
- _____ 39. Which statement is true for the equation $x = \sqrt{6x + 7}$?
- A. 7 and -1 are roots.
 B. 7 is a root of the original equation and -1 is an extraneous root.
 C. 1 is a root of the original equation and -7 is an extraneous root.
 D. 7 and 1 are both extraneous roots.
- _____ 40. Which equations have only one root?
- i) $x^2 = 0$ ii) $x^2 = x$
 iii) $x(x - 2) = 0$ iv) $\sqrt{x - 4} = 2$
- A. i and ii C. ii and iii
 B. i, ii, and iv D. i and iv
- _____ 41. Solve: $2x(3x - 6) = 0$
- A. $x = 0$ or $x = -2$ C. $x = \frac{1}{2}$ or $x = -2$
 B. $x = \frac{1}{2}$ or $x = 2$ D. $x = 0$ or $x = 2$
- _____ 42. Solve by factoring: $x^2 + 4x - 21 = 0$
- A. $x = -7$ or $x = 3$ C. $x = 7$ or $x = -3$
 B. $x = -7$ or $x = -3$ D. $x = 7$ or $x = 3$
- _____ 43. Solve by factoring: $3x^2 + 4x - 4 = 0$
- A. $x = \frac{2}{3}$ or $x = 2$ C. $x = 2$ or $x = -2$
 B. $x = 2$ or $x = 2$ D. $x = \frac{2}{3}$ or $x = -2$
- _____ 44. Solve this equation: $(x - 1)^2 - 7 = 24$
- A. $x = 1 \pm \sqrt{17}$ C. $x = -1 \pm \sqrt{31}$
 B. $x = 1 \pm \sqrt{31}$ D. $x = -1 \pm \sqrt{17}$
- _____ 45. Determine the value of \square that makes $x^2 - 13x + \square$ a perfect square.
- A. 169 B. 84.5 C. 6.5 D. 42.25

- _____ 46. Solve $x^2 + 8x + 13 = 0$ by completing the square.
- A. $x = -4 \pm \sqrt{3}$ C. $x = 64 \pm \sqrt{3}$
B. $x = 4 \pm \sqrt{19}$ D. $x = -8 \pm \sqrt{19}$
- _____ 47. Which expression is a solution of the equation $4x^2 - 2x - 1 = 0$?
- A. $-1 + \sqrt{5}$ C. $\frac{1 + \sqrt{5}}{4}$
B. $\frac{-1 + \sqrt{2}}{4}$ D. $-1 + 4\sqrt{2}$
- _____ 48. Solve this quadratic equation: $x^2 + 8x + 5 = 0$
- A. $x = 4 \pm 3\sqrt{3}$ C. $x = -4 \pm \sqrt{11}$
B. $x = -8 \pm 3\sqrt{3}$ D. $x = 64 \pm \sqrt{11}$
- _____ 49. The coefficients of a quadratic equation are all integers. The discriminant is -49 . Which statement best describes its roots?
- A. Two rational roots C. No real roots
B. One rational root D. Two irrational roots
- _____ 50. The coefficients of a quadratic equation are all integers. Which discriminant indicates that the equation has two irrational roots?
- A. $\frac{64}{196}$ B. 64 C. 0.64 D. 6.4
- _____ 51. The quadratic equation $3x^2 + 6x + d = 0$ has only one root. Use the quadratic formula to determine the value of d .
- A. $d = 1$ B. $d = 4$ C. $d = 6$ D. $d = 3$
- _____ 52. Use a graphing calculator to determine the x -intercepts of the quadratic function $y = -9x^2 - 7x + 10$. Write the intercepts to the nearest hundredth, if necessary.
- A. -1.51 and 0.73 C. -1.12 and 1.12
B. -0.73 and 1.51 D. -3.02 and 1.47
- _____ 53. Two numbers have a difference of 12 and their product is a minimum. Determine the numbers.
- A. -6 and 6 B. -3 and 9 C. 6 and 18 D. 0 and 12
- _____ 54. Does the quadratic function $y = (x + 10)(34 - x)$ have a maximum value or a minimum value? What is that value?
- A. minimum value; 484 C. maximum value; 484
B. minimum value; 340 D. maximum value; 340
- _____ 55. A rectangular dog pen is to be fenced with 24 m of fencing. Determine the maximum area and the width of this rectangle.
- A. $A = 36 \text{ m}^2$; $w = 12 \text{ m}$ C. $A = 108 \text{ m}^2$; $w = 6 \text{ m}$
B. $A = 84 \text{ m}^2$; $w = 12 \text{ m}$ D. $A = 36 \text{ m}^2$; $w = 6 \text{ m}$

_____ 56. Identify the quadratic function that this table of values represents:

x	-4	-2	0	2	4
y	54	14	-2	6	38

- A. $y = 3x^2 - 2x - 2$ C. $y = -2x^2 + 3x - 2$
B. $y = 2x^2 - 2x - 3$ D. $y = -3x^2 + 2x + 2$

_____ 57. Use graphing technology to approximate the solution of this equation: $2x^2 - 3x - 4 = 0$
Write the roots to 1 decimal place.

- A. The roots are approximately $x = 2.4$ and $x = -0.9$.
B. The roots are approximately $x = 1.6$ and $x = -1.6$.
C. The roots are approximately $x = 0.9$ and $x = -2.4$.
D. The roots are approximately $x = 4.7$ and $x = -1.7$.

_____ 58. Determine the coordinates of the vertex of the graph of this quadratic function: $y = -4x^2 + 10x - 4$

- A. (1.25, 4.5) B. (-2.5, 4.5) C. (1.25, 2.25) D. (-2.5, 2.25)

_____ 59. A ball is thrown upward with a speed of 16 m/s. Its height, h metres, after t seconds is modelled by the equation $h = -5t^2 + 16t + 3$. What is the maximum height of the ball, to the nearest tenth?

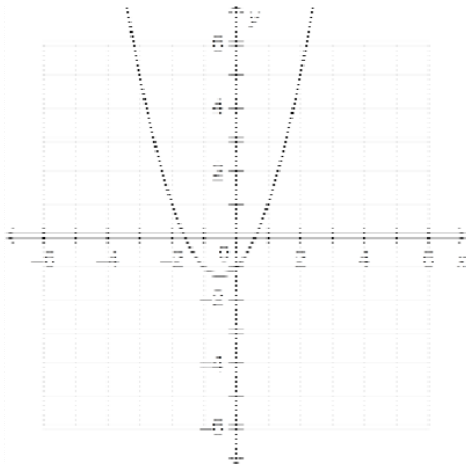
- A. 15.8 m B. 14 m C. 20.6 m D. 41.4 m

_____ 60. For a quadratic function, which characteristic of its graph is equivalent to the zero of the function?

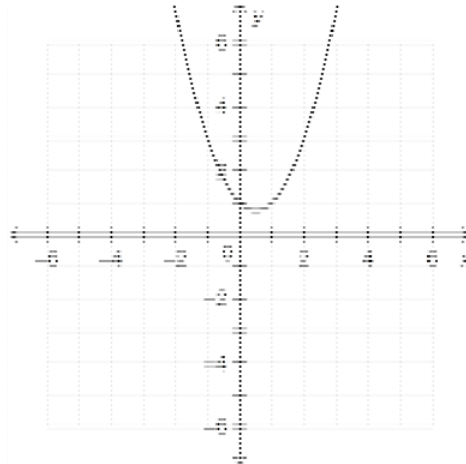
- A. minimum point C. x -intercept
B. maximum point D. y -intercept

_____ 61. Which graph represents the quadratic function $y = x^2 + x - 1$?

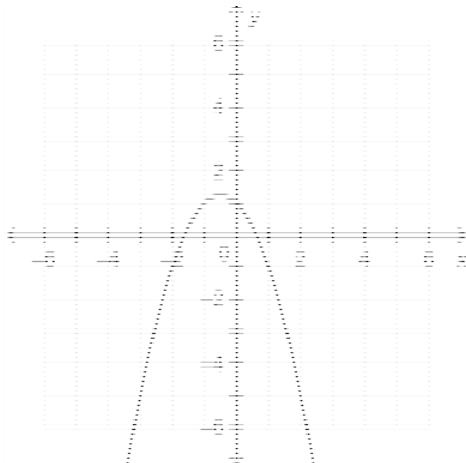
A.



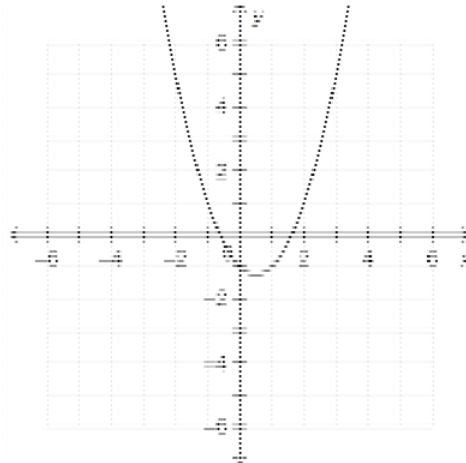
C.



B.



D.



_____ 62. Identify the y-intercept of the graph of this quadratic function: $y = x^2 + 2x + 39$

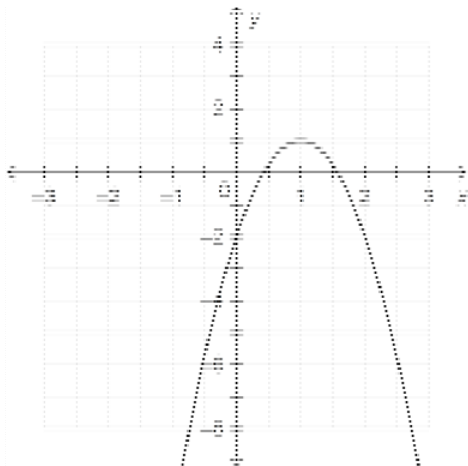
A. 37

B. 0

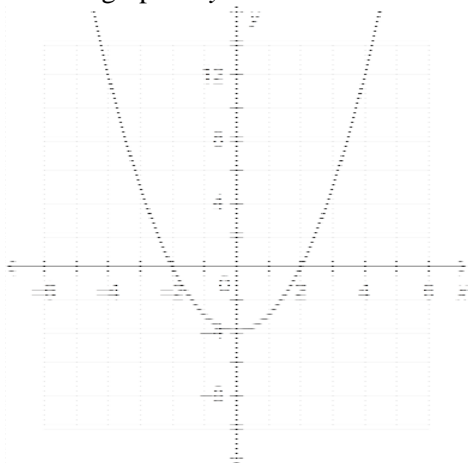
C. 39

D. 4

- _____ 63. The graph of a quadratic function is shown. Which of the numbers below could be the discriminant of the corresponding quadratic equation?



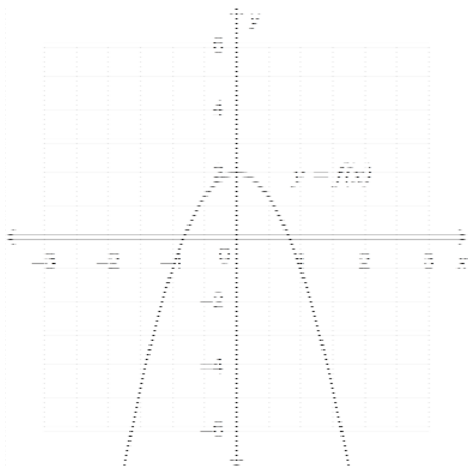
- A. 10
B. -1
C. 0
D. None of the above
- _____ 64. Use the graph of $y = x^2 - 4$ to determine the roots of $x^2 - 4 = 0$.



- A. $x = -2$ and $x = 2$
B. There are no real roots.
C. $x = \pm\sqrt{2}$
D. $x = -4$
- _____ 65. Which of the following describes the translation that would be applied to the graph of $y = x^2$ to get the graph of $y = x^2 + 5$?
- A. Translate 5 units left
B. Translate 5 units up
C. Translate 5 units down
D. Translate 5 units right

- _____ 66. Which statement is NOT true for the graph of $y = x^2 + q$?
- A. When q is positive, the graph lies above the x -axis.
B. As q increases, the graph moves up.
C. When q is negative, the vertex is above the x -axis.
D. The graph has the same size and shape as the graph of $y = x^2$.

_____ 67. Determine an equation of this graph of a quadratic function.



A. $y = -\frac{1}{3}x^2 + 2$

C. $y = 3x^2$

B. $y = -3x^2 + 2$

D. $y = \frac{1}{3}x^2 - 2$

_____ 68. Identify the coordinates of the vertex of the graph of this quadratic function: $y = \frac{1}{8}(x - 4)^2 - 4$

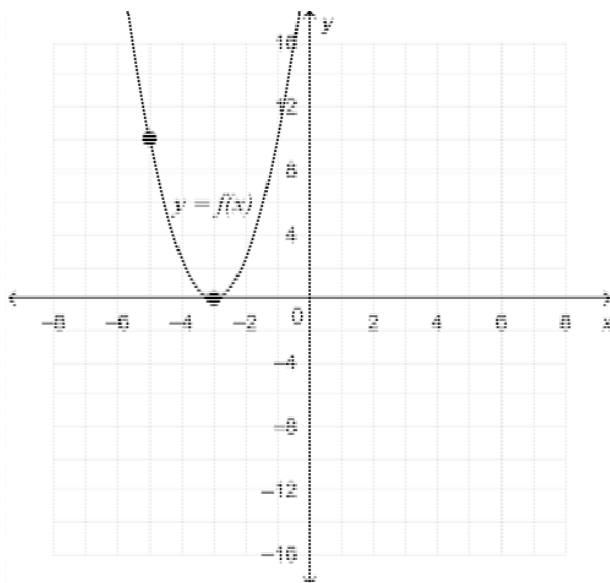
A. (4, 4)

B. (-4, -4)

C. (-4, 4)

D. (4, -4)

_____ 69. Determine an equation of this graph of a quadratic function.



A. $y = 2.5(x - 3)^2 - 2$

C. $y = -2.5(x + 3)^2 - 2$

B. $y = 2.5(x + 3)^2$

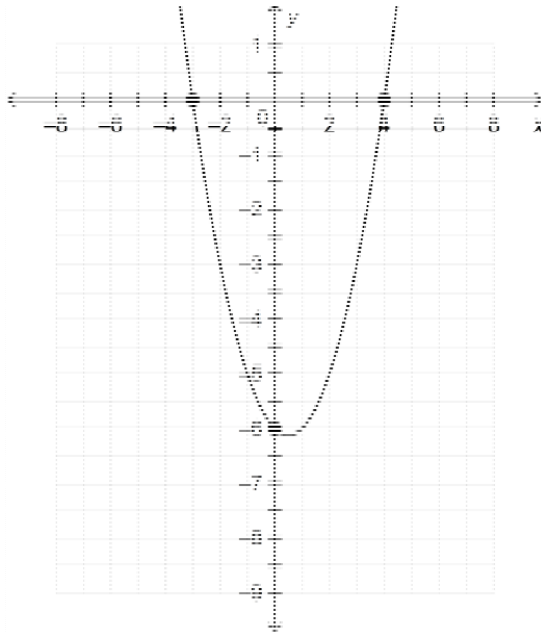
D. $y = 2.5(x + 3)^2 - 2$

- _____ 70. Determine an equation of a quadratic function with the given characteristics of its graph: coordinates of the vertex: $V(0, 2)$; passes through $A(-2, -18)$
- A. $y = -2x^2 + 2$ C. $y = -5x^2 - 2$
B. $y = -18x^2 - 2$ D. $y = -5x^2 + 2$
- _____ 71. Which equation represents the same quadratic function as $y = (x + 3)^2 - 1$?
- A. $x^2 - 2x + 8$ C. $x^2 + 8x + 6$
B. $x^2 + 6x + 8$ D. $x^2 - 6x + 8$
- _____ 72. Determine the number that would be added to $x^2 - 3x$ to get a perfect square trinomial.
- A. 3 B. $\frac{9}{2}$ C. $\frac{9}{4}$ D. 9
- _____ 73. Write this equation in standard form: $y = x^2 - 12x + 28$
- A. $y = (x - 12)^2 - 8$ C. $y = (x - 6)^2 + 64$
B. $y = (x - 6)^2 - 8$ D. $y = (x - 12)^2 + 34$
- _____ 74. Write this equation in standard form: $y = -3x^2 + 12x - 16$
- A. $y = -3(x + 2)^2 - 4$ C. $y = -3(x - 2)^2 - 4$
B. $y = (x - 2)^2 - 4$ D. $y = -3(x + 2)^2 + 4$
- _____ 75. A quadratic function has zeros -3 and 8 . What is the equation of the axis of symmetry of its graph?
- A. $x = 2.5$ B. $x = -5.5$ C. $x = -2.5$ D. $x = 5.5$
- _____ 76. Determine the zeros of this quadratic function: $y = x^2 - 4x - 32$
- A. -4 and 8 B. 4 and -8 C. 4 and 8 D. -4 and -8
- _____ 77. Determine the zeros of this quadratic function: $y = x^2 - 2x - 35$
- A. -5 and 7 B. -5 and -7 C. 5 and 7 D. 5 and -7
- _____ 78. Determine the x -intercepts, the equation of the axis of symmetry, and the coordinates of the vertex of the graph of $y = -x^2 - 2x + 3$
- A. x -intercepts: 3 and -1 ; axis of symmetry: $x = -1$; vertex: $(-1, -4)$
B. x -intercepts: -3 and -1 ; axis of symmetry: $x = -1$; vertex: $(-1, -4)$
C. x -intercepts: 3 and 1 ; axis of symmetry: $x = 1$; vertex: $(1, 4)$
D. x -intercepts: -3 and 1 ; axis of symmetry: $x = -1$; vertex: $(-1, 4)$

Name: _____

ID: A

____ 79. For this graph of a quadratic function, write the equation in factored form.



A. $y = 0.5(x + 3)(x - 4)$

B. $y = 2(x + 3)(x - 4)$

C. $y = 2(x - 3)(x + 4)$

D. $y = -0.5(x - 3)(x + 4)$

Short Answer

1. Factor this polynomial expression: $(3x - 1)^2 + 6(3x - 1) + 9$

2. Factor this polynomial expression: $25x^2 + 10x - 8$

3. Solve this equation: $\sqrt{x^2 + 4} + 2 = 5x$

4. A baseball is hit upward. The approximate height of the baseball, h metres, after t seconds is modelled by this formula: $h = 1 + 15t - 5t^2$
When is the baseball 11 m high?

5. Solve this quadratic equation: $2x(x - 5) = 3(x - 5) + 3$

6. Use a graphing calculator to graph the quadratic function $y = 1.5x^2 + 6x + 9$.

Determine:

a) the intercepts

b) the coordinates of the vertex

c) the equation of the axis of symmetry

d) the domain of the function

e) the range of the function

Round the answers to the nearest hundredth, if necessary.

Name: _____

ID: A

7. The weekly profit, P hundred dollars, of a company is modelled by the equation $P = -3x^2 + 6x + 3$, where x is the number of units produced per week, in thousands.

a) Use a graphing calculator to determine the number of units the company should produce per week to earn the maximum weekly profit. _____

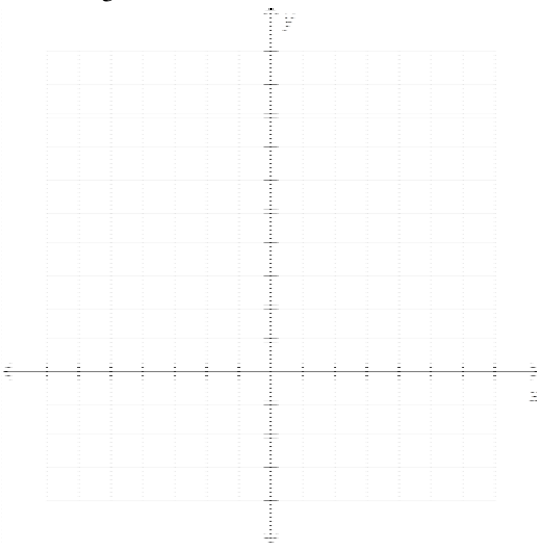
b) What is the maximum weekly profit? _____

8. A rectangular lot is bordered on one side by a building and the other 3 sides by 300 m of fencing. Determine the area of the largest lot possible. _____

9. Graph each quadratic function on the same grid without using a table of values or a graphing calculator.

a) $y = 2x^2$

b) $y = \frac{1}{3}x^2$



Name: _____

ID: A

10. Determine the x - and y -intercepts, the equation of the axis of symmetry, and the coordinates of the vertex of the graph of $y = -2x^2 + 8x - 6$.

11. The graph of a quadratic function passes through A(3, 12) and has x -intercepts 1 and 5. Write an equation of the graph in factored form.

Problem

1. When 8 is added to an integer, x , the absolute value of the sum is 5. Determine a value for x . How many different values of x are possible? Show how you solved the problem.

2. Sixteen congruent squares are placed together to form a large square. The 4 middle squares are removed. The final shape is a square within a square. The area of the large square is 80 square units.

- a) What is the area of the inner square?
 b) What is the difference between the perimeters of the outer square and the inner square?

Explain your work.



3. Expand and simplify this expression: $(-5\sqrt{2} + 3\sqrt{3})(-6\sqrt{2} - 2\sqrt{3})$

Show your work.

4. a) Identify the values of the variables for which this expression is defined.
 b) Write the expression in simplest form. Show your work.

$$\frac{-5\sqrt{s} + 3\sqrt{t}}{4\sqrt{s} - 5\sqrt{t}}$$

Name: _____

ID: A

5. Determine whether the given value of x is a root of this equation. Justify your answer.

$$\sqrt{5x-5} = \sqrt{6x-8}; x = 9$$

6. Does this equation have a real root? If so, determine its value.

$$6 = \sqrt{8-7x}$$

7. Solve this equation, then verify the solution: $\sqrt{x+14} = x-16$
Explain your steps.

8. Solve $x^2 - 13x - 7 = 0$ by completing the square. Show your work.

9. Consider this quadratic equation: $-x^2 + \frac{2}{3}x - \frac{1}{2} = 0$
- Rewrite the equation so that it does not contain fractions.
 - Solve the equation. Explain your answer.

-
10. Determine the values of k for which the equation $kx^2 + 6x + 3 = 0$ has two real roots, then write a possible equation.

-
11. Determine the values of k for which the equation $9x^2 - kx + 1 = 0$ has exactly one real root, then write a possible equation.

-
12. A toy rocket is launched from a platform. The height of the rocket, h metres, t seconds after launch is modelled by the equation $h = -4.9t^2 + 28t + 3$.

- Use a graphing calculator to graph the quadratic function.
- Determine the t -intercepts of the graph, to the nearest hundredth. What do they represent?

-
- To the nearest metre, what is the greatest height that the rocket reached? Explain how you know.

-
- What is the domain? What does it represent?
-

Name: _____

ID: A

13. Write $y = x^2 - 7x - 13$ in standard form, then identify the coordinates of the vertex. Show your work.

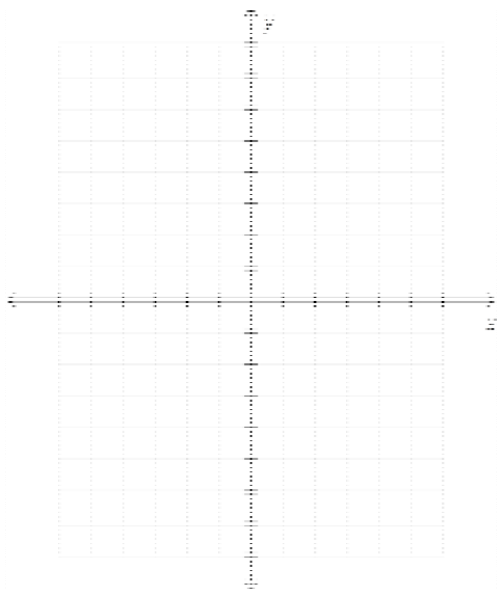
14. A hospital sells raffle tickets to raise funds for new medical equipment. Last year, 2000 tickets were sold for \$24 each. The fund-raising coordinator estimates that for every \$1 decrease in price, 125 more tickets will be sold.

a) What decrease in price will maximize the revenue?

b) What is the price of a ticket that will maximize the revenue?

c) What is the maximum revenue?

15. Graph the quadratic function $y = -x^2 + 4x - 3$.



Determine:

a) the intercepts

b) the coordinates of the vertex

c) the equation of the axis of symmetry

d) the domain of the function

e) the range of the function

Name: _____

ID: A

16. a) Identify the coordinates of the vertex, the direction of opening, the equation of the axis of symmetry, the intercepts, the domain and the range for this quadratic function: $y = \frac{1}{2}(x - 2)^2 + 4$

the coordinates of the vertex

direction of opening

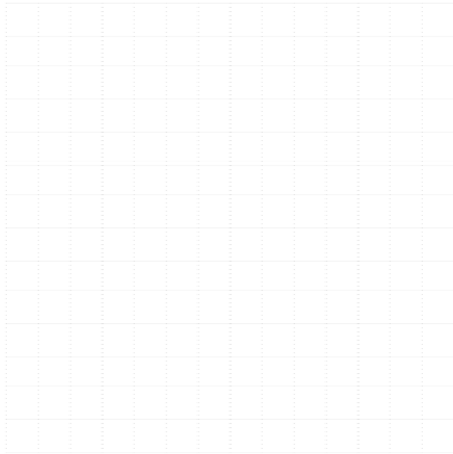
the equation of the axis of symmetry

the intercepts

the domain of the function

the range of the function

- b) Sketch a graph.



Pre-Calc 11 Term 1 Pre-test Answer Section

MULTIPLE CHOICE

1. ANS: B PTS: 0 DIF: Easy
REF: 2.1 Absolute Value of a Real Number LOC: 11.AN1
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
2. ANS: C PTS: 0 DIF: Moderate
REF: 2.1 Absolute Value of a Real Number LOC: 11.AN1
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
3. ANS: A PTS: 0 DIF: Moderate
REF: 2.1 Absolute Value of a Real Number LOC: 11.AN1
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
4. ANS: B PTS: 0 DIF: Moderate
REF: 2.1 Absolute Value of a Real Number LOC: 11.AN1
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
5. ANS: C PTS: 0 DIF: Easy
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
6. ANS: B PTS: 0 DIF: Moderate
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
7. ANS: D PTS: 0 DIF: Easy
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
8. ANS: C PTS: 0 DIF: Moderate
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
9. ANS: D PTS: 0 DIF: Moderate
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
10. ANS: A PTS: 0 DIF: Moderate
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
11. ANS: D PTS: 0 DIF: Difficult
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
12. ANS: D PTS: 0 DIF: Moderate
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
13. ANS: C PTS: 0 DIF: Difficult
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
14. ANS: B PTS: 0 DIF: Moderate
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge

15. ANS: A PTS: 0 DIF: Difficult
REF: 2.2 Simplifying Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge | Conceptual Understanding
16. ANS: B PTS: 0 DIF: Easy
REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
17. ANS: A PTS: 0 DIF: Moderate
REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
18. ANS: A PTS: 0 DIF: Easy
REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
19. ANS: C PTS: 0 DIF: Easy
REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
20. ANS: D PTS: 0 DIF: Moderate
REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
21. ANS: A PTS: 0 DIF: Moderate
REF: 2.3 Adding and Subtracting Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
22. ANS: D PTS: 0 DIF: Easy
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
23. ANS: A PTS: 0 DIF: Easy
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
24. ANS: A PTS: 0 DIF: Easy
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Procedural Knowledge
25. ANS: C PTS: 0 DIF: Moderate
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
26. ANS: A PTS: 0 DIF: Moderate
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
27. ANS: A PTS: 0 DIF: Moderate
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
28. ANS: B PTS: 0 DIF: Moderate
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
29. ANS: A PTS: 0 DIF: Difficult
REF: 2.4 Multiplying and Dividing Radical Expressions LOC: 11.AN2
TOP: Relations and Functions KEY: Conceptual Understanding | Procedural Knowledge
30. ANS: A PTS: 0 DIF: Easy REF: 2.5 Solving Radical Equations
LOC: 11.AN3 TOP: Relations and Functions KEY: Procedural Knowledge

31. ANS: B PTS: 0 DIF: Easy REF: 2.5 Solving Radical Equations
LOC: 11.AN3 TOP: Relations and Functions KEY: Procedural Knowledge
32. ANS: D PTS: 0 DIF: Moderate REF: 2.5 Solving Radical Equations
LOC: 11.AN3 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge
33. ANS: A PTS: 0 DIF: Moderate REF: 2.5 Solving Radical Equations
LOC: 11.AN3 TOP: Relations and Functions KEY: Procedural Knowledge
34. ANS: A PTS: 0 DIF: Moderate REF: 2.5 Solving Radical Equations
LOC: 11.AN3 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge
35. ANS: D PTS: 0 DIF: Difficult REF: 2.5 Solving Radical Equations
LOC: 11.AN3 TOP: Relations and Functions
KEY: Conceptual Understanding | Procedural Knowledge
36. ANS: B PTS: 0 DIF: Moderate
REF: 3.1 Factoring Polynomial Expressions LOC: 11.RF1
TOP: Relations and Functions KEY: Procedural Knowledge
37. ANS: D PTS: 0 DIF: Moderate
REF: 3.1 Factoring Polynomial Expressions LOC: 11.RF1
TOP: Relations and Functions KEY: Procedural Knowledge
38. ANS: A PTS: 0 DIF: Moderate
REF: 3.1 Factoring Polynomial Expressions LOC: 11.RF1
TOP: Relations and Functions KEY: Procedural Knowledge
39. ANS: B PTS: 0 DIF: Moderate
REF: 3.2 Solving Quadratic Equations by Factoring LOC: 11.AN3
TOP: Algebra and Number KEY: Conceptual Understanding
40. ANS: D PTS: 0 DIF: Easy
REF: 3.2 Solving Quadratic Equations by Factoring LOC: 11.RF5
TOP: Relations and Functions KEY: Conceptual Understanding
41. ANS: D PTS: 0 DIF: Easy
REF: 3.2 Solving Quadratic Equations by Factoring LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
42. ANS: A PTS: 0 DIF: Easy
REF: 3.2 Solving Quadratic Equations by Factoring LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
43. ANS: D PTS: 0 DIF: Moderate
REF: 3.2 Solving Quadratic Equations by Factoring LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
44. ANS: B PTS: 0 DIF: Easy
REF: 3.3 Using Square Roots to Solve Quadratic Equations LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
45. ANS: D PTS: 0 DIF: Easy
REF: 3.3 Using Square Roots to Solve Quadratic Equations LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
46. ANS: A PTS: 0 DIF: Moderate
REF: 3.3 Using Square Roots to Solve Quadratic Equations LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge

47. ANS: C PTS: 0 DIF: Moderate
REF: 3.4 Developing and Applying the Quadratic Formula LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
48. ANS: C PTS: 0 DIF: Moderate
REF: 3.4 Developing and Applying the Quadratic Formula LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
49. ANS: C PTS: 0 DIF: Easy REF: 3.5 Interpreting the Discriminant
LOC: 11.RF5 TOP: Relations and Functions KEY: Conceptual Understanding
50. ANS: D PTS: 0 DIF: Moderate REF: 3.5 Interpreting the Discriminant
LOC: 11.RF5 TOP: Relations and Functions KEY: Conceptual Understanding
51. ANS: D PTS: 0 DIF: Difficult
REF: 3.4 Developing and Applying the Quadratic Formula LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
52. ANS: A PTS: 0 DIF: Moderate
REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4
TOP: Relations and Functions KEY: Procedural Knowledge
53. ANS: A PTS: 0 DIF: Moderate
REF: 4.7 Modelling and Solving Problems with Quadratic Functions
LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
54. ANS: C PTS: 0 DIF: Easy
REF: 4.7 Modelling and Solving Problems with Quadratic Functions
LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
55. ANS: D PTS: 0 DIF: Moderate
REF: 4.7 Modelling and Solving Problems with Quadratic Functions
LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
56. ANS: A PTS: 0 DIF: Moderate
REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4
TOP: Relations and Functions KEY: Procedural Knowledge
57. ANS: A PTS: 0 DIF: Easy
REF: 4.2 Solving a Quadratic Equation Graphically LOC: 11.RF5
TOP: Relations and Functions KEY: Procedural Knowledge
58. ANS: C PTS: 0 DIF: Moderate
REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$
LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
59. ANS: A PTS: 0 DIF: Moderate
REF: 4.7 Modelling and Solving Problems with Quadratic Functions
LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
60. ANS: C PTS: 0 DIF: Easy
REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4
TOP: Relations and Functions KEY: Conceptual Understanding
61. ANS: A PTS: 0 DIF: Moderate
REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4
TOP: Relations and Functions KEY: Procedural Knowledge
62. ANS: C PTS: 0 DIF: Easy
REF: 4.1 Properties of a Quadratic Function LOC: 11.RF4
TOP: Relations and Functions KEY: Procedural Knowledge

63. ANS: A PTS: 0 DIF: Easy
 REF: 4.2 Solving a Quadratic Equation Graphically LOC: 11.RF5
 TOP: Relations and Functions KEY: Conceptual Understanding
64. ANS: A PTS: 0 DIF: Easy
 REF: 4.2 Solving a Quadratic Equation Graphically LOC: 11.RF5
 TOP: Relations and Functions KEY: Conceptual Understanding
65. ANS: B PTS: 0 DIF: Easy
 REF: 4.3 Transforming the Graph of $y = x^2$ LOC: 11.RF3
 TOP: Relations and Functions KEY: Conceptual Understanding
66. ANS: C PTS: 0 DIF: Easy
 REF: 4.3 Transforming the Graph of $y = x^2$ LOC: 11.RF3
 TOP: Relations and Functions KEY: Conceptual Understanding
67. ANS: B PTS: 0 DIF: Moderate
 REF: 4.4 Analyzing Quadratic Functions of the Form $y = a(x - p)^2 + q$
 LOC: 11.RF3 TOP: Relations and Functions KEY: Procedural Knowledge
68. ANS: D PTS: 0 DIF: Easy
 REF: 4.4 Analyzing Quadratic Functions of the Form $y = a(x - p)^2 + q$
 LOC: 11.RF3 TOP: Relations and Functions KEY: Conceptual Understanding
69. ANS: B PTS: 0 DIF: Moderate
 REF: 4.4 Analyzing Quadratic Functions of the Form $y = a(x - p)^2 + q$
 LOC: 11.RF3 TOP: Relations and Functions KEY: Procedural Knowledge
70. ANS: D PTS: 0 DIF: Moderate
 REF: 4.4 Analyzing Quadratic Functions of the Form $y = a(x - p)^2 + q$
 LOC: 11.RF3 TOP: Relations and Functions
 KEY: Conceptual Understanding | Procedural Knowledge
71. ANS: B PTS: 0 DIF: Easy
 REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
72. ANS: C PTS: 0 DIF: Easy
 REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
73. ANS: B PTS: 0 DIF: Easy
 REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
74. ANS: C PTS: 0 DIF: Moderate
 REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
75. ANS: A PTS: 0 DIF: Easy
 REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
76. ANS: A PTS: 0 DIF: Easy
 REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
77. ANS: A PTS: 0 DIF: Easy
 REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge
78. ANS: D PTS: 0 DIF: Moderate
 REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge

79. ANS: A PTS: 0 DIF: Moderate
 REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$
 LOC: 11.RF4 TOP: Relations and Functions KEY: Procedural Knowledge

SHORT ANSWER

1. ANS:

$$(3x + 2)^2$$

PTS: 0 DIF: Moderate REF: 3.1 Factoring Polynomial Expressions
 LOC: 11.RF1 TOP: Relations and Functions KEY: Procedural Knowledge

2. ANS:

$$(5x - 2)(5x + 4)$$

PTS: 0 DIF: Moderate REF: 3.1 Factoring Polynomial Expressions
 LOC: 11.RF1 TOP: Relations and Functions KEY: Procedural Knowledge

3. ANS:

$$x = \frac{5}{6}$$

PTS: 0 DIF: Moderate REF: 3.2 Solving Quadratic Equations by Factoring
 LOC: 11.AN3 TOP: Algebra and Number KEY: Procedural Knowledge

4. ANS:

The baseball is 11 m high after 1 s and after 2 s.

PTS: 0 DIF: Moderate REF: 3.2 Solving Quadratic Equations by Factoring
 LOC: 11.RF5 TOP: Relations and Functions
 KEY: Problem-Solving Skills | Procedural Knowledge

5. ANS:

$$x = \frac{13 \pm \sqrt{73}}{4}$$

PTS: 0 DIF: Moderate REF: 3.4 Developing and Applying the Quadratic Formula
 LOC: 11.RF5 TOP: Relations and Functions KEY: Procedural Knowledge

6. ANS:

- a) x -intercepts: none
 y -intercept: 9
- b) vertex: $(-2, 3)$
- c) axis of symmetry: $x = -2$
- d) domain: $x \in \mathbb{R}$
- e) range: $y \geq 3, y \in \mathbb{R}$

PTS: 0 DIF: Moderate REF: 4.1 Properties of a Quadratic Function
 LOC: 11.RF4 TOP: Relations and Functions
 KEY: Conceptual Understanding | Procedural Knowledge

7. ANS:

- a) The company should produce 1000 units per week to earn the maximum weekly profit.
 b) The maximum weekly profit is \$600.

PTS: 0 DIF: Moderate REF: 4.1 Properties of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

8. ANS:

11 250 m²

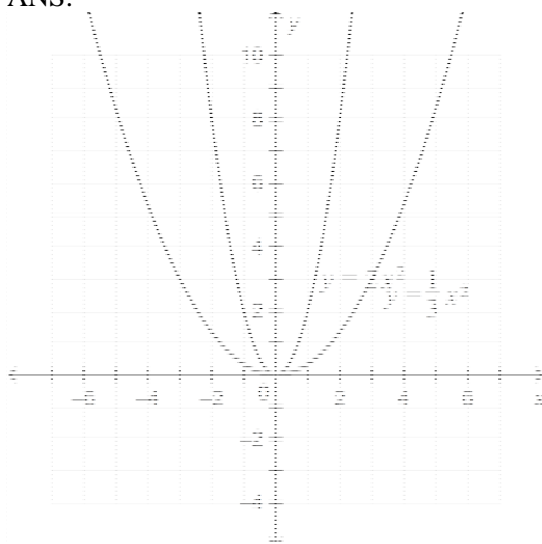
PTS: 0 DIF: Moderate

REF: 4.7 Modelling and Solving Problems with Quadratic Functions

LOC: 11.RF4 TOP: Relations and Functions

KEY: Problem-Solving Skills | Procedural Knowledge

9. ANS:



PTS: 0 DIF: Moderate REF: 4.3 Transforming the Graph of $y = x^2$

LOC: 11.RF3 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

10. ANS:

y-intercept: -6

x-intercepts: 1 and 3

equation of the axis of symmetry: $x = 2$

coordinates of the vertex: (2, 2)

PTS: 0 DIF: Moderate

REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$

LOC: 11.RF4 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge

11. ANS:

$$y = -3(x - 1)(x - 5)$$

PTS: 0

DIF: Moderate

REF: 4.6 Analyzing Quadratic Functions of the Form $y = ax^2 + bx + c$

LOC: 11.RF4

TOP: Relations and Functions

KEY: Procedural Knowledge

PROBLEM

1. ANS:

Write, then solve an equation: $|x + 8| = 5$ Since $|5| = 5$ and $|-5| = 5$ then, $x + 8 = 5$ or $x + 8 = -5$

$$x = -3 \qquad \qquad \qquad x = -13$$

So, two values of x are possible: -3 or -13

PTS: 0

DIF: Difficult

REF: 2.1 Absolute Value of a Real Number

LOC: 11.AN1

TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

2. ANS:

a) The area of the large square is 80 square units.

So, the area of each small square is: $\frac{80}{16}$, or 5 square units.The inner square has the area of 4 small squares: $4(5) = 20$

The area of the inner square is 20 square units.

b) The side length of a small square is the square root of its area: $\sqrt{5}$ units

The perimeter of the outer square is equal to 16 times the side length of the small square:

$$16\sqrt{5} \text{ units}$$

The perimeter of the inner square is equal to 8 times the side length of the small square:

$$8\sqrt{5}$$

$$\text{Difference between perimeters: } 16\sqrt{5} - 8\sqrt{5} = 8\sqrt{5}$$

The difference between the perimeters of the outer square and the inner square is $8\sqrt{5}$ units.

PTS: 0

DIF: Moderate

REF: 2.3 Adding and Subtracting Radical Expressions

LOC: 11.AN2

TOP: Relations and Functions

KEY: Procedural Knowledge | Communication | Problem-Solving Skills

3. ANS:

$$\begin{aligned} & (-5\sqrt{2} + 3\sqrt{3})(-6\sqrt{2} - 2\sqrt{3}) \\ &= -5\sqrt{2}(-6\sqrt{2} - 2\sqrt{3}) + 3\sqrt{3}(-6\sqrt{2} - 2\sqrt{3}) \\ &= 60 + 10\sqrt{6} - 18\sqrt{6} - 18 \\ &= 42 - 8\sqrt{6} \end{aligned}$$

PTS: 0

DIF: Easy

REF: 2.4 Multiplying and Dividing Radical Expressions

LOC: 11.AN2

TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

4. ANS:

a) $s \geq 0$ and $t \geq 0$

$$\begin{aligned} \text{b) } \frac{-5\sqrt{s} + 3\sqrt{t}}{4\sqrt{s} - 5\sqrt{t}} &= \frac{(-5\sqrt{s} + 3\sqrt{t})}{(4\sqrt{s} - 5\sqrt{t})} \cdot \frac{(4\sqrt{s} + 5\sqrt{t})}{(4\sqrt{s} + 5\sqrt{t})} \\ &= \frac{-20s - 25\sqrt{st} + 12\sqrt{st} + 15t}{(4\sqrt{s})^2 - (5\sqrt{t})^2} \\ &= \frac{-20s - 13\sqrt{st} + 15t}{16s - 25t} \end{aligned}$$

PTS: 0 DIF: Moderate REF: 2.4 Multiplying and Dividing Radical Expressions

LOC: 11.AN2 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

5. ANS:

$$\begin{array}{ll} \text{L.S.} = \sqrt{5x-5} & \text{R.S.} = \sqrt{6x-8} \\ = \sqrt{5(9)-5} & = \sqrt{6(9)-8} \\ = \sqrt{40} & = \sqrt{46} \end{array}$$

Since the left side does not equal the right side, $x = 9$ is not a root of the equation.

PTS: 0 DIF: Easy REF: 2.5 Solving Radical Equations

LOC: 11.AN3 TOP: Relations and Functions

KEY: Procedural Knowledge | Communication

6. ANS:

Since $8 - 7x \geq 0$, then $x \leq 1\frac{1}{7}$

$$\begin{aligned} 6 &= \sqrt{8-7x} \\ 6^2 &= (\sqrt{8-7x})^2 \\ 36 &= 8-7x \\ 28 &= -7x \\ x &= -4 \end{aligned}$$

Since $x = -4$ lies in the set of possible values for x , $x = -4$ is a real root.

PTS: 0 DIF: Moderate REF: 2.5 Solving Radical Equations

LOC: 11.AN3 TOP: Relations and Functions

KEY: Conceptual Understanding | Procedural Knowledge | Communication

7. ANS:

$$\begin{aligned} \sqrt{x+14} &= x-16 && \text{Square each side of the equation.} \\ (\sqrt{x+14})^2 &= (x-16)^2 \\ x+14 &= x^2-32x+256 && \text{Combine like terms.} \\ 0 &= x^2-33x+242 && \text{Factor.} \\ 0 &= (x-11)(x-22) && \text{Solve using the zero product property.} \end{aligned}$$

Either $x-11=0$ or $x-22=0$
 $x=11$ $x=22$

Check for extraneous roots.

In $\sqrt{x+14} = x-16$, substitute: $x=11$ and $x=22$

$$\begin{array}{ll} \text{L.S.} = \sqrt{x+14} & \text{L.S.} = \sqrt{x+14} \\ = \sqrt{11+14} & = \sqrt{22+14} \\ = \sqrt{25} & = \sqrt{36} \\ = 5 & = 6 \\ \text{R.S.} = x-16 & \text{R.S.} = x-16 \\ = 11-16 & = 22-16 \\ = -5 & = 6 \end{array}$$

For $x=11$, the left side does not equal the right side, so $x=11$ is not a root of the radical equation.For $x=22$, the left side is equal to the right side, so this solution is verified.The root is: $x=22$

PTS: 0 DIF: Difficult REF: 3.2 Solving Quadratic Equations by Factoring
 LOC: 11.AN3 TOP: Algebra and Number
 KEY: Communication | Problem-Solving Skills

8. ANS:

$$\begin{aligned} x^2-13x-7 &= 0 \\ x^2-13x &= 7 \\ x^2-13x+\frac{169}{4} &= 7+\frac{169}{4} \\ \left(x-\frac{13}{2}\right)^2 &= \frac{197}{4} \\ x-\frac{13}{2} &= \pm\sqrt{\frac{197}{4}} \\ x &= \frac{13}{2} \pm \sqrt{\frac{197}{4}} \\ x &= \frac{13 \pm \sqrt{197}}{2} \end{aligned}$$

The roots are: $x = \frac{13 + \sqrt{197}}{2}$ and $x = \frac{13 - \sqrt{197}}{2}$

PTS: 0 DIF: Moderate REF: 3.3 Using Square Roots to Solve Quadratic Equations
 LOC: 11.RF5 TOP: Relations and Functions
 KEY: Communication | Problem-Solving Skills

9. ANS:

a) Multiply each side by the common denominator, 6, to remove the fractions.

$$-x^2 + \frac{2}{3}x - \frac{1}{2} = 0$$

$$-6x^2 + 4x - 3 = 0$$

b) Substitute: $a = -6$, $b = 4$, $c = -3$ in: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(-6)(-3)}}{2(-6)}$$

$$x = \frac{-4 \pm \sqrt{-56}}{-12}$$

Since $\sqrt{-56}$ is not a real number, the equation has no real roots.

PTS: 0 DIF: Moderate REF: 3.4 Developing and Applying the Quadratic Formula

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

10. ANS:

For an equation to have two real roots, $b^2 - 4ac > 0$

Substitute: $a = k$, $b = 6$, $c = 3$

$$(6)^2 - 4(k)(3) > 0$$

$$36 - 12k > 0$$

$$-12k > -36$$

$$k < 3$$

For $kx^2 + 6x + 3 = 0$ to have two real roots, k must be less than 3.

Sample response: A possible value of k is 2. So, an equation with two real roots is: $2x^2 + 6x + 3 = 0$

PTS: 0 DIF: Moderate REF: 3.5 Interpreting the Discriminant

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

11. ANS:

For an equation to have exactly one real root, $b^2 - 4ac = 0$

Substitute: $a = 9$, $b = -k$, $c = 1$

$$(-k)^2 - 4(9)(1) = 0$$

$$k^2 - 36 = 0$$

$$k^2 = 36$$

$$k = \pm 6$$

For $9x^2 - kx + 1 = 0$ to have exactly one real root, k must be equal to ± 6 .

Sample response: A possible value of k is 6. So, an equation with exactly one real root is: $9x^2 - 6x + 1 = 0$

PTS: 0 DIF: Moderate REF: 3.5 Interpreting the Discriminant

LOC: 11.RF5 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

12. ANS:

- b) The t -intercepts are -0.11 and 5.82 . The t -intercepts represent the times at which the height of the rocket is 0 m. Time cannot be negative, so the height of the rocket is 0 m at about 5.82 s.
- c) The maximum value of the function represents the greatest height of the rocket. The greatest height that the rocket reached was approximately 43 m.
- d) The domain is: $0 \leq t \leq 5.82$. The domain represents the time the toy rocket was in the air: about 5.82 s.

PTS: 0 DIF: Difficult REF: 4.1 Properties of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Conceptual Understanding | Problem-Solving Skills | Procedural Knowledge

13. ANS:

$$\begin{aligned}
 y &= (x^2 - 7x) - 13 && \text{Add and subtract: } \left(\frac{-7}{2}\right)^2 = \frac{49}{4} \\
 &= \left(x^2 - 7x + \frac{49}{4} - \frac{49}{4}\right) - 13 \\
 &= \left(x^2 - 7x + \frac{49}{4}\right) - \frac{49}{4} - 13 \\
 &= \left(x - \frac{7}{2}\right)^2 - \frac{49}{4} - 13 \\
 &= \left(x - \frac{7}{2}\right)^2 - \frac{101}{4}
 \end{aligned}$$

Compare this with $y = a(x - p)^2 + q$.The vertex of the parabola has coordinates $\left(\frac{7}{2}, -\frac{101}{4}\right)$.

PTS: 0 DIF: Moderate

REF: 4.5 Equivalent Forms of the Equation of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

14. ANS:

Determine an equation to represent the situation.

For each \$1 decrease in price, 125 more tickets will be sold. Let x represent the number of \$1 decreases in the price of a ticket.

When the price decreases by \$1 x times:

- the price, in dollars, of a ticket is $24 - x$.
- the number of tickets sold is $2000 + 125x$.
- the revenue, in dollars, is $(24 - x)(2000 + 125x)$.

Let the revenue be R dollars.

An equation is: $R = (24 - x)(2000 + 125x)$

Use a graphing calculator.

Graph: $R = (24 - x)(2000 + 125x)$

Use the CALC function to determine the coordinates of the vertex.

- a) From the graph, the maximum revenue occurs when the number of \$1 decreases is 4. So, the decrease in price that will maximize the revenue is \$4.
- b) The price of a ticket that will maximize the revenue is: $\$24 - \$4 = \$20$
- c) Substitute $x = 4$ in $R = (24 - x)(2000 + 125x)$ to determine the maximum revenue.

$$R = (24 - 4)(2000 + 125(4))$$

$$R = 50\,000$$

The maximum revenue is \$50 000.

PTS: 0

DIF: Difficult

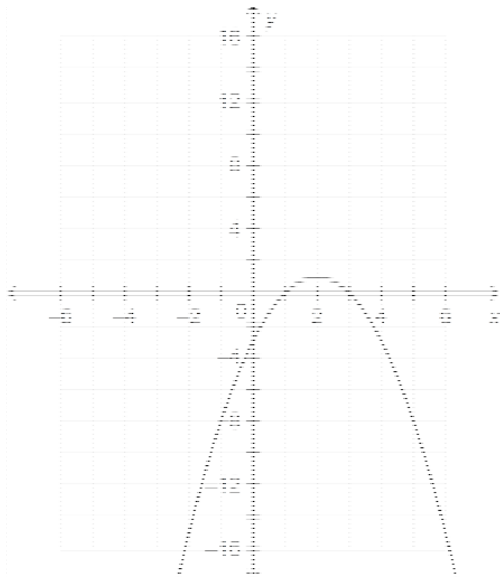
REF: 4.7 Modelling and Solving Problems with Quadratic Functions

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Problem-Solving Skills

15. ANS:

x	-4	-3	-2	-1	0	1	2	3	4
y	-35	-24	-15	-8	-3	0	1	0	-3



- a) x -intercepts: 1, 3
 y -intercept: -3
- b) vertex: (2, 1)
- c) axis of symmetry: $x = 2$
- a) domain: $x \in \mathbb{R}$
- b) range: $y \leq 1, y \in \mathbb{R}$

PTS: 0 DIF: Moderate REF: 4.1 Properties of a Quadratic Function

LOC: 11.RF4 TOP: Relations and Functions

KEY: Communication | Procedural Knowledge

16. ANS:

Compare $y = \frac{1}{2}(x-2)^2 + 4$ with the vertex form $y = a(x-p)^2 + q$.

a) a is positive, so the graph opens up.

$p = 2$ and $q = 4$, so the coordinates of the vertex are: $(2, 4)$

The equation of the axis of symmetry is $x = p$; that is $x = 2$.

To determine the y -intercept, substitute $x = 0$.

$$y = \frac{1}{2}(0-2)^2 + 4$$

$$y = 6$$

The y -intercept is 6.

To determine the x -intercepts, substitute $y = 0$.

$$0 = \frac{1}{2}(x-2)^2 + 4$$

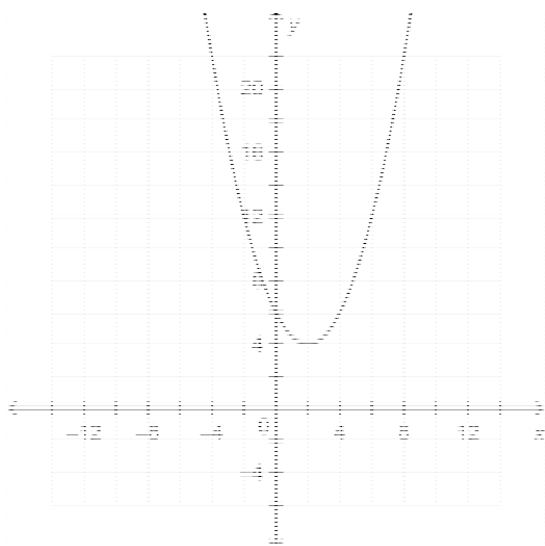
$$-8 = (x-2)^2$$

This equation has no solution, so there are no x -intercepts.

The domain is: $x \in \mathbb{R}$

The graph opens up, so the vertex is a minimum point with y -coordinate 4. The range is: $y \geq 4$, $y \in \mathbb{R}$

b)



PTS: 0

DIF: Moderate

REF: 4.4 Analyzing Quadratic Functions of the Form $y = a(x-p)^2 + q$

LOC: 11.RF3 TOP: Relations and Functions

KEY: Communication | Conceptual Understanding | Procedural Knowledge