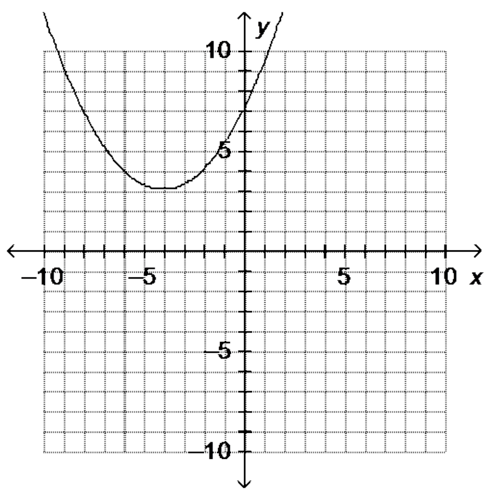
Algebra 2 Chapter 2 Practice Test

1. Compare the graph of $g(x) = (x-6)^2 + 10$ with the graph of $f(x) = x^2$.
   a. The graph of $g(x)$ is a translation 6 units left and 10 units up from the graph of $f(x)$.
   b. The graph of $g(x)$ is a translation 6 units right and 10 units up from the graph of $f(x)$.
   c. The graph of $g(x)$ is a translation 6 units left and 10 units down from the graph of $f(x)$.
   d. The graph of $g(x)$ is a translation 6 units right and 10 units down from the graph of $f(x)$.

2. Martha incorrectly graphed the function $g(x) = -\frac{1}{4}(x-4)^2 + 3$ using transformations of the graph of $f(x) = x^2$. First she stated what transformations to perform, and then she drew the graph. Describe any errors.

   (1) A vertical shrink by a factor of $\frac{1}{4}$
   (2) A shift left 4 units
   (3) A shift up 3 units

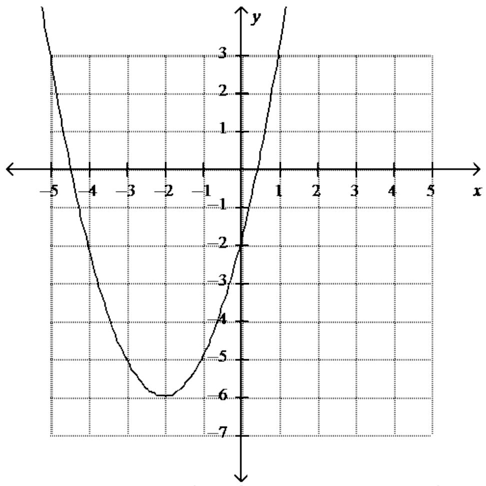


3. Use this description to write the quadratic function:
   The parent function $f(x) = x^2$ is vertically stretched by a factor of 6 and translated 2 units right, followed by a translation 6 units up.
   a. $g(x) = \frac{1}{6}(x-2)^2 + 6$
   b. $g(x) = 6(x-2)^2 + 6$
   c. $g(x) = 6(x-2)^2 - 6$
   d. $g(x) = 6(x+2)^2 + 6$

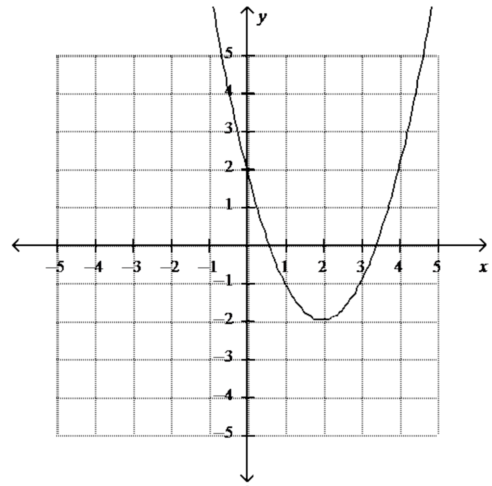
4. If $f(x) = x^2 - 3$, which of the following is equal to $g(x) = f(x+2)$?
   a. $g(x) = x^2 - 1$
   b. $g(x) = x^2 + 4x + 4$
   c. $g(x) = x^2 + 1$
   d. $g(x) = x^2 + 4x + 1$

5. Use symmetry to graph the quadratic function $f(x) = x^2 - 4x - 2$.

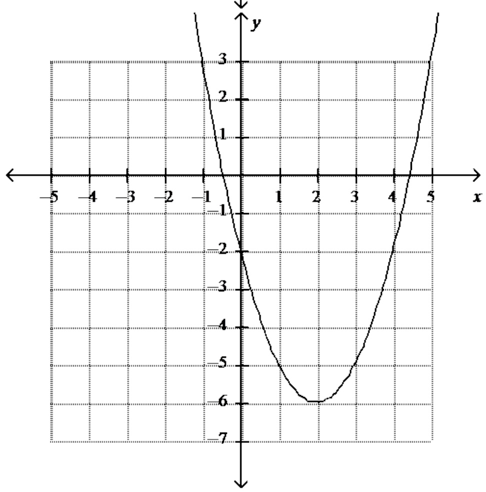
a.



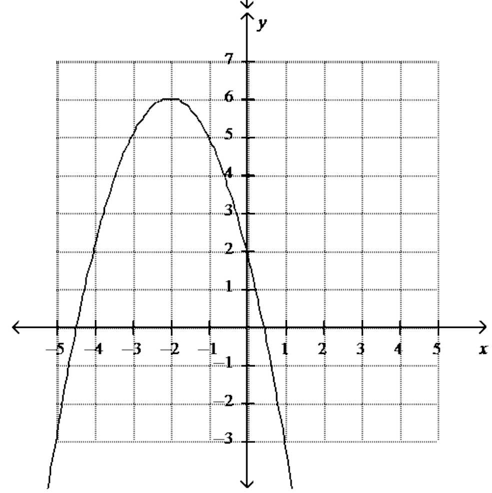
c.



b.

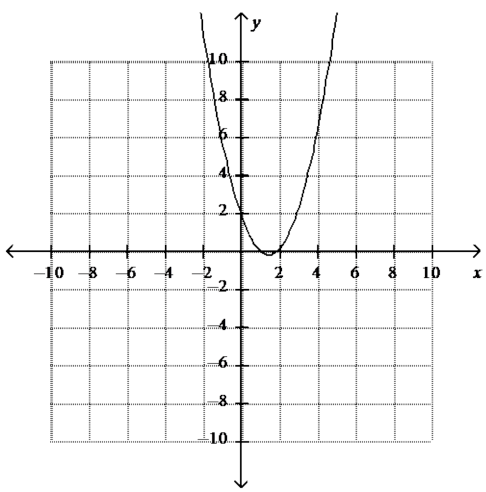


d.

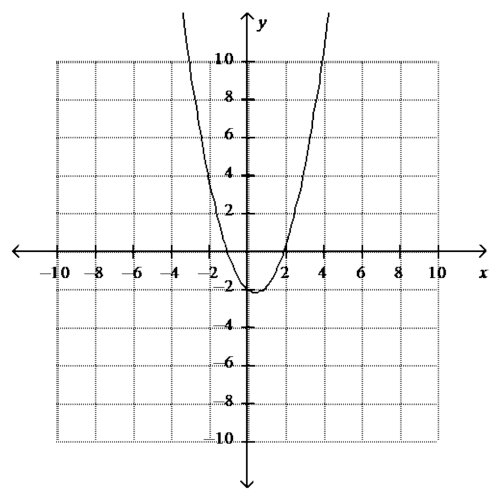


6. Graph the quadratic function $f(x) = (x + 1)(x + 2)$.

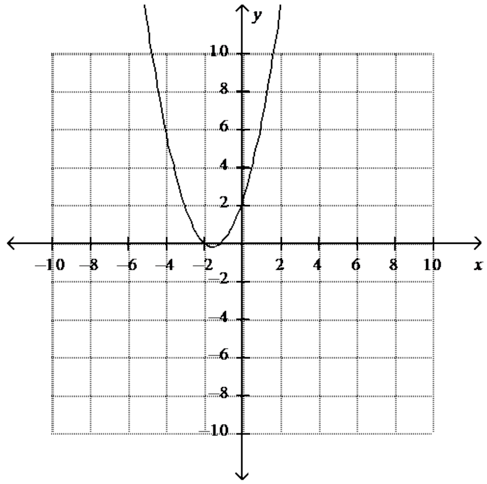
a.



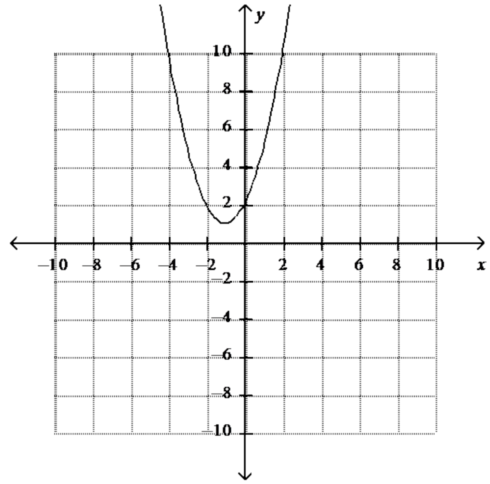
c.



b.

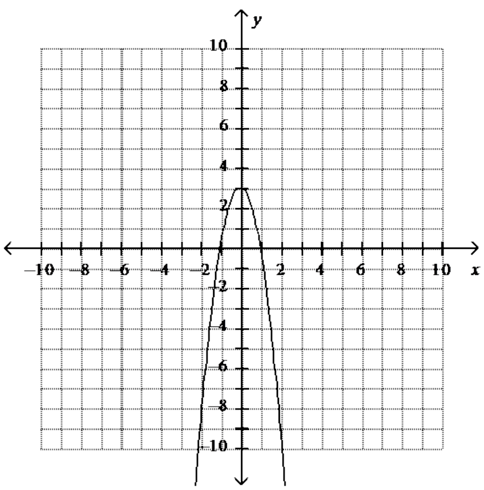


d.



7. Find the maximum value of each quadratic function. Then decide which function has the greater maximum value.

--Quadratic Function 1: The function whose equation is $y = -x^2 - 2x + 3$.
--Quadratic Function 2: The function whose graph is shown.



a. The maximum value of Quadratic Function 1 is 4.

The maximum value of Quadratic Function 2 is 0.

Quadratic Function 1 has the greater maximum value.

b. The maximum value of Quadratic Function 1 is 4.

The maximum value of Quadratic Function 2 is 3.

Quadratic Function 1 has the greater maximum value.

c. The maximum value of Quadratic Function 1 is –1.

The maximum value of Quadratic Function 2 is 3.

Quadratic Function 2 has the greater maximum value.

d. The maximum value of Quadratic Function 1 is –1.

The maximum value of Quadratic Function 2 is 0.

Quadratic Function 2 has the greater maximum value.

8. A rocket leaves a launcher at a height of 7 feet off the ground with an initial velocity of 144 feet per second. The equation describing the rocket's height after *t* seconds is $h = -16t^2 + 144t + 7$. Find the maximum height reached by the rocket and how many seconds it takes for the rocket to reach that height.

9. Write an equation in standard form for a parabola with vertex $(0, 0)$ and directrix $y = -6$.

a. $y = \frac{1}{24}x^2$

c. $y = -\frac{1}{24}x^2$

b. $x = 24y^2$

d. $x = \frac{1}{24}y^2$

10. Write an equation in standard form for a parabola with focus $F(0, -6)$ and directrix $y = 6$.

a. $y = \frac{1}{24}x^2$

c. $x = -\frac{1}{24}y^2$

b. $x = \frac{1}{24}y^2$

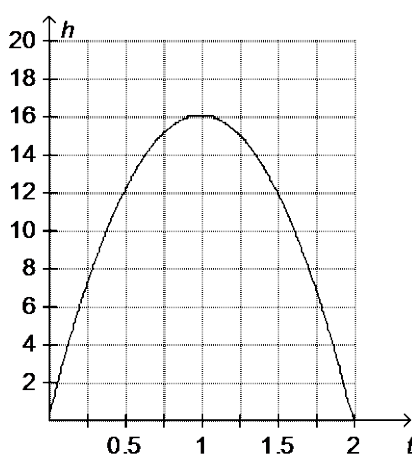
d. $y = -\frac{1}{24}x^2$

11. A parabola has focus (4, 0) and directrix $x = -4$.

***Part A*:** What is the equation of the parabola?

***Part B*:** Without graphing, tell the direction in which the parabola opens. How do you know?

12. The graph shows the height h, in feet, of a football at time t, in seconds, from the moment it was kicked at ground level. Estimate the average rate of change in height from $t = 1.5$ seconds to $t = 1.75$ seconds.



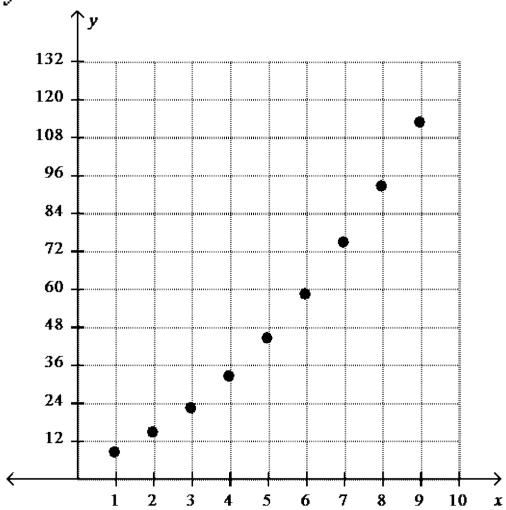
a. -20 feet per second

b. -12 feet per second
c. 12 feet per second
d. 20 feet per second

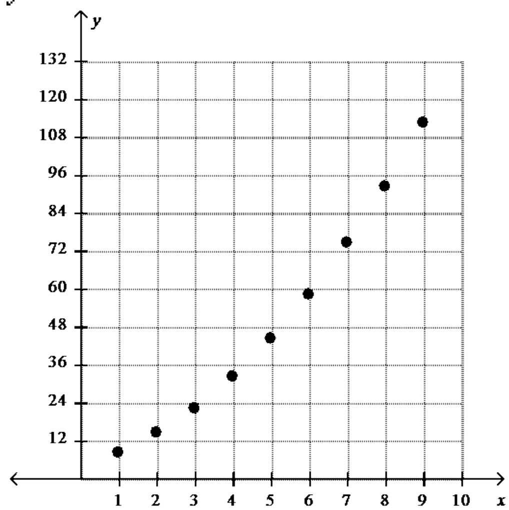
13. Make a scatter plot of the data. Then find an equation of the quadratic function that models the data.

x	1	2	3	4	5	6	7	8	9
y	8	14	22	32	44	58	74	92	112

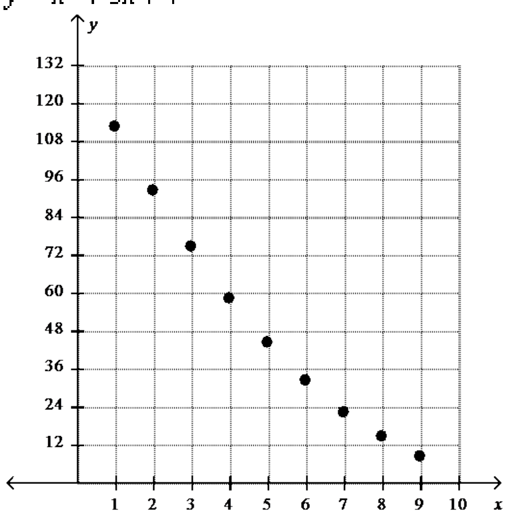
a. $y = x^2 + 3x - 4$



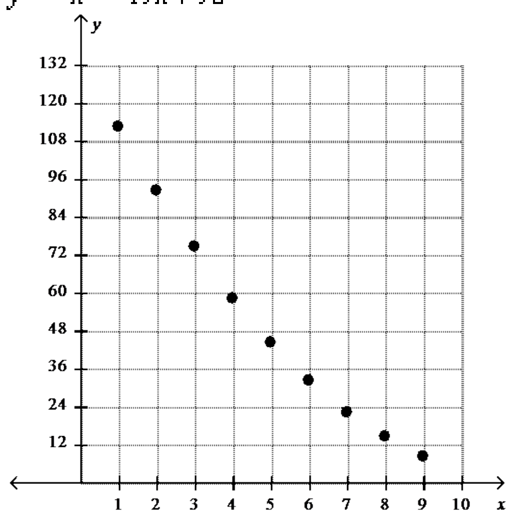
c. $y = x^2 + 3x + 4$



b. $y = x^2 + 3x + 4$



d. $y = -x^2 - 19x + 92$



14. A satellite television receiver is a parabolic dish with an equation of $y = \frac{1}{26}x^2$. The receptor is placed at the focus. How far from the vertex of the parabola is the receptor? Explain your reasoning.

15. A spotlight uses a parabolic reflector, a surface with a parabolic cross section, and a light bulb at the focus of the parabola. If the bulb is 2 inches from the vertex of the reflector, what is the equation of the parabola? Explain your reasoning.

16. An observatory has a large antenna to collect signals from space. The antenna has a curved surface with a parabolic cross section, and a microphone is located at the focus of the parabola. The microphone is 9.5 feet from the vertex of the parabola. Write an equation that can be used to model the parabola. Explain how you found your equation.

17. Consider the graph of $f(x) = -\frac{1}{2}x^2 + 2x + 6$. Find the intercepts. Find the vertex and state whether it is a minimum or a maximum. Determine the intervals where $f(x)$ is increasing and decreasing and the intervals where it is positive and negative.

18. The table below gives the stopping distance *y* (in 100 meters) for a train traveling on a track at various speeds *x* (miles per hour).

Speed, *x* (mi/h)	50	55	60	65	70	75	80	85	90
Distance, *y* (100 m)	20	25	35	50	70	95	125	160	200

Find an equation of the quadratic function that models the data, and predict the stopping distance for the train traveling at 95 miles per hour.

a. $y = 0.1x^2 - 9.5x + 245$
about 245 hundred meters

b. $y = 0.1x^2 + 9.5x + 245$
about 2,050 hundred meters

c. $y = 0.1x^2 + 9.5x + 245$
about 245 hundred meters

d. $y = 0.1x^2 - 9.5x + 245$
about 2,050 hundred meters

19. Audrey graphs a quadratic function. The graph of her quadratic function passes through the points $(-1, 0)$, $(-0.5, 0)$, and $(0, 1)$. Which quadratic function could be Audrey's function?

a. $y = -6x^2 + 19x + 1$
b. $y = 6x^2 - 6x + 1$
c. $y = 2x^2 - 3x + 1$
d. $y = 2x^2 + 3x + 1$

20. The function *f* is a quadratic function whose graph opens upward and has its vertex at (3, –4). The *x*-intercepts of *f* are 1 and 5.
The function *g* is also a quadratic function that passes through the points shown in the table below.

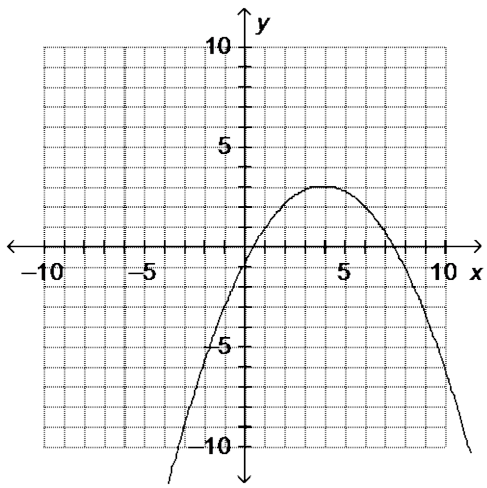
x	***g*(*x*)**
–3	–4
–2	–5
–1	–4
0	–1
1	4
2	11
3	20

Part A: For each function, find the axis of symmetry of its graph. Explain how you found the axes of symmetry and compare their locations in the coordinate plane.

Part B: Function f is represented by a verbal description. Function g is represented numerically in a table. Are those the best representations for comparing the locations of the axes of symmetry? If so, explain why. If not, how would you represent f and g to make their axes of symmetry easier to compare?

Algebra 2 Chapter 2 Practice Test
Answer Section

1. ANS: B PTS: 1 NAT: NT.CCSS.MTH.10.9-12.F.BF.3
   MSC: DOK 1 NOT: 2.1
2. ANS:
   Martha's interpretation of the horizontal shift is incorrect. Since 4 is being subtracted from x, the parent function will shift right 4 units.
   Martha did not notice that the coefficient of $(x-4)^2$ is negative. This reflects the parent function about the x-axis.



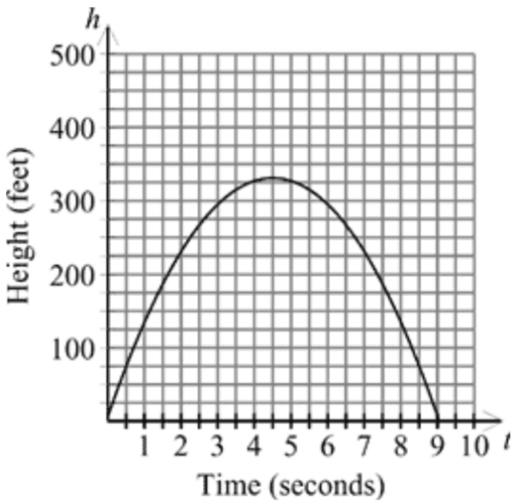
   Rubric
   2 points recognizing Martha forgot the reflection;
   2 points for recognizing the error in Martha's horizontal shift statement

   PTS: 4 NAT: NT.CCSS.MTH.10.9-12.F.BF.3 | NT.CCSS.MTH.10.K-12.MP.3
   KEY: quadratic functions | transformations | vertical stretches | horizontal shifts | vertical shifts | reflection | graphing using transformations MSC: DOK 2 NOT: 2.1
3. ANS: B PTS: 1
   NAT: NT.CCSS.MTH.10.9-12.F.IF.8 | NT.CCSS.MTH.10.9-12.F.BF.3
   MSC: DOK 1 NOT: 2.1
4. ANS: D PTS: 1 NAT: NT.CCSS.MTH.10.9-12.F.BF.3
   MSC: DOK 1 NOT: 2.1
5. ANS: B PTS: 1 REF: a03dcc5b-9631-11dd-8a40-001185f11039
   OBJ: Graphing Quadratic Functions NAT: NT.CCSS.MTH.10.9-12.F.IF.7.a
   STA: PA.PAAS.MTH.02.6-8.2.5.8.A | PA.PAAS.MTH.02.6-8.2.8.8.G
   LOC: MTH.P.06.03.012 | MTH.C.10.07.06.005 | MTH.C.10.07.06.01.001
   TOP: Quadratic Functions KEY: quadratic function | graph
   MSC: DOK 1 NOT: 2.2
6. ANS: B PTS: 1 REF: a03df36b-9631-11dd-8a40-001185f11039
   OBJ: Graphing Quadratic Functions NAT: NT.CCSS.MTH.10.9-12.F.IF.7.a
   STA: PA.PAAS.MTH.02.6-8.2.5.8.A | PA.PAAS.MTH.02.6-8.2.8.8.G
   LOC: MTH.P.06.03.012 | MTH.C.10.07.06.005 | MTH.C.10.07.06.01.001
   TOP: Quadratic Functions KEY: quadratic function | graph

MSC: DOK 1 NOT: 2.2

7. ANS: B PTS: 1 NAT: NT.CCSS.MTH.10.9-12.F.IF.9
TOP: Model Relationships KEY: model | data | linear | exponential | quadratic
MSC: DOK 2 NOT: 2.2

8. ANS:



331 feet at 4.5 seconds

PTS: 1 REF: MALG1379 NAT: NT.CCSS.MTH.10.9-12.F.IF.7.a
TOP: Graph y = ax^2 + bx + c KEY: parabola | vertex | word | real-life | maximum
MSC: DOK 2 NOT: 2.2

9. ANS: A PTS: 1 REF: 1759046e-4683-11df-9c7d-001185f0d2ea
OBJ: Writing Equations of Parabolas NAT: NT.CCSS.MTH.10.9-12.G.GPE.2
STA: PA.PAAS.MTH.02.9-11.2.8.11.E LOC: MTH.C.10.09.04.01.009
TOP: Parabolas MSC: DOK 1 NOT: 2.3

10. ANS: D PTS: 1 NAT: NT.CCSS.MTH.10.9-12.G.GPE.2
KEY: parabola | focus | directrix MSC: DOK 1 NOT: 2.3

11. ANS:

***Part A*:** $x = \frac{1}{16}y^2$

***Part B*:** The parabola is horizontal because the directrix is a vertical line. The focus is located to the right of the directrix. A parabola opens away from its directrix in the direction of its focus, so this parabola opens to the right.

PTS: 1 NAT: NT.CCSS.MTH.10.9-12.G.GPE.2 MSC: DOK 3
NOT: 2.3

12. ANS: A

$$\text{average rate of change} = \frac{h(1.75) - h(1.5)}{1.75 - 1.5} = \frac{7 - 12}{0.25} = \frac{-5}{0.25} = -20 \text{ feet per second}$$

	Feedback
A	That’s correct!
B	You found the average rate of change from $t = 1.25$ seconds to $t = 1.5$ seconds.

C	You found the average rate of change from $t = 0.5$ seconds to $t = 0.75$ seconds.
D	Remember to subtract the values associated with $t = 1.5$ from the values associated with $t = 1.75$.

PTS: 1 NAT: NT.CCSS.MTH.10.9-12.F.IF.6* | NT.CCSS.MTH.10.K-12.MP.4
KEY: average rate of change from a graph | modeling MSC: DOK 2
NOT: 2.4

13. ANS: C PTS: 1 REF: fa185935-6ff9-11df-9c81-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.S.ID.6.a KEY: quadratic regression | modeling
MSC: DOK 2 NOT: 2.4

14. ANS:
6.5 units

Solve for *p* using the standard equation of a parabola with its vertex at (0, 0). So, $26 = 4p$, or $6.5 = p$.

PTS: 1 NAT: NT.CCSS.MTH.10.9-12.G.GPE.2 MSC: DOK 3
NOT: 2.3

15. ANS:
$y = \frac{1}{8}x^2$.

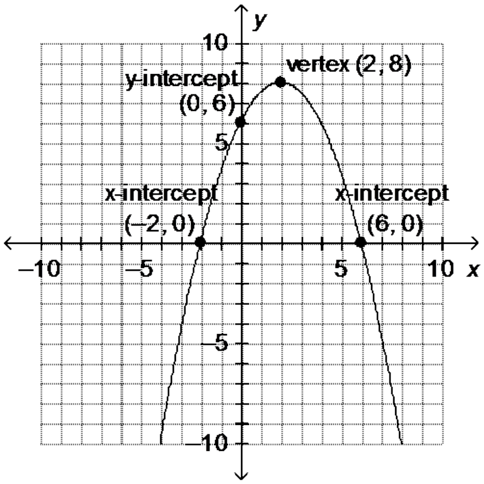
Because the focus is 2 inches from the vertex, the directrix is also 2 inches from the vertex. I can use the vertex as (0, 0) and use the standard equations of a parabola with vertex at the origin. Using the equation for a parabola with a vertical axis of symmetry gives my answer.

PTS: 1 NAT: NT.CCSS.MTH.10.9-12.G.GPE.2 MSC: DOK 3
NOT: 2.3

16. ANS:
Sample answer: For simplicity, assume that the parabola opens upward and has its vertex at the origin. Then the equation of the parabola is in the form $y = \frac{1}{4p}x^2$, where $(0, p)$ is the focus. The focus is 9.5 feet from the vertex, so $p = 9.5$. The equation is $y = \frac{1}{4(9.5)}x^2 = \frac{1}{38}x^2$.

PTS: 1 NAT: NT.CCSS.MTH.10.9-12.G.GPE.2 MSC: DOK 4
NOT: 2.3

17. ANS:



The vertex is a maximum.

$f(x)$ is increasing when $x < 2$ and decreasing when $x > 2$.

$f(x)$ is negative when $x < -2$ and when $x > 6$. It is positive when $-2 < x < 6$.

Rubric

1 point for finding each intercept;
1 point for finding the vertex;
1 point for stating the vertex is a maximum;
0.5 point each for the interval of increase and the interval of decrease;
0.5 point each for the interval of negative $f(x)$ and the interval of positive $f(x)$

PTS: 7 NAT: NT.CCSS.MTH.10.9-12.F.IF.7.a* | NT.CCSS.MTH.10.9-12.F.IF.4*
KEY: function | graph of a function | quadratic function | intercepts | vertex | maximum | increasing | decreasing
MSC: DOK 2 NOT: 2.2

18. ANS: A PTS: 1 REF: fa15cfc6-6ff9-11df-9c81-001185f0d2ea
NAT: NT.CCSS.MTH.10.9-12.S.ID.6.a KEY: quadratic regression | modeling
MSC: DOK 3 NOT: 2.4

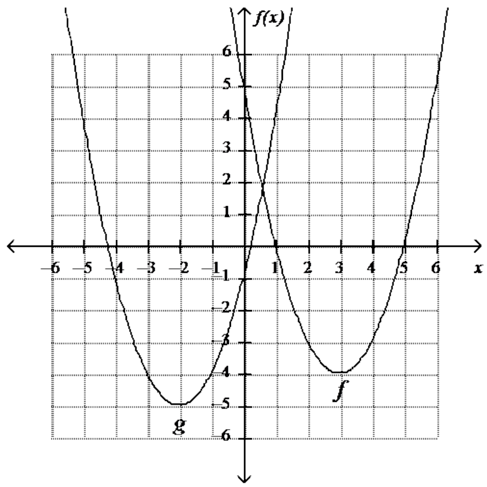
19. ANS: D PTS: 1 NAT: NT.CCSS.MTH.10.9-12.F.BF.1.a
MSC: DOK 2 NOT: 2.4

20. ANS:

Part A: The description of *f* says that the vertex of its graph is (3, –4). The axis of symmetry is the vertical line through the vertex, so the axis of symmetry is the line $x = 3$.

Function *g* passes through (–3, –4) and (–1, –4), and the axis of symmetry is a vertical line halfway between these points. This indicates that the axis of symmetry is the line $x = -2$. The axis of symmetry of the graph of *f* is located to the right of the *y*-axis and the axis of symmetry of the graph of *g* is located to the left of the *y*-axis.

Part B: Sample answer: No; because the axis of symmetry is a characteristic of a function’s graph, it would be easy to quickly identify and compare axes of symmetry if both functions were represented graphically:



PTS: 1 NAT: NT.CCSS.MTH.10.9-12.F.IF.9 MSC: DOK 3
NOT: 2.2