10.2 Quadratics in Vertex Form

Directions: Pick the best answer.

1) Which of the following is true about the quadratic function $f(x) = (x-4)^2 + 5.$ *(→ y value and opens up!)*

a) It has a max value at y = 5.
b) It has a min value at y = 4.
c) It has a max value at y = 4.
d) It has a min value at y = 5. *(circled)*

2) Which of the following is true about the quadratic function $f(x) = -2(x-4)^2 + 5.$ *(→ neg sign opens down)*

a) It is skinner than its parent function and opens down. *(circled)*
b) It is skinner than its parent function and opens up.
c) It is wider than its parent function and opens down.
d) It is wider than its parent function and opens up.

Directions: Graph each function. Then answer the questions. Plot the vertex and at least 2 other points, more if possible.

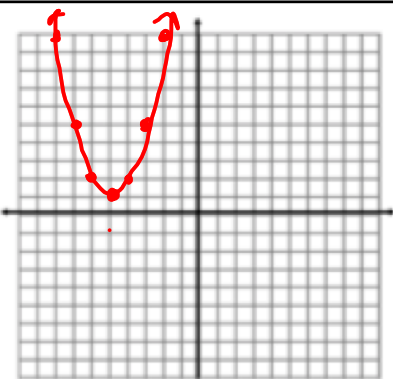3) $f(x) = (x+5)^2 + 1$ $(-5, 1)$

Standard form:
$y = (x+5)(x+5) + 1$
$= x^2 + 5x + 5x + 25 + 1$
$y = x^2 + 10x + 26$

Y-int: $(0, 26)$

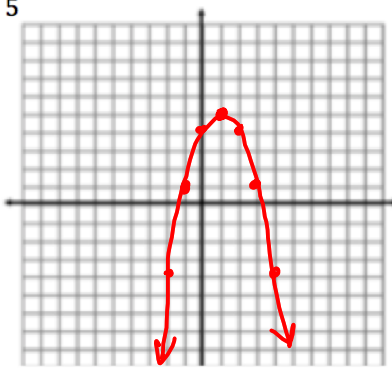4) $f(x) = -(x-1)^2 + 5$ $(1, 5)$

Standard form:
$y = -(x-1)(x-1) + 5$
$y = -(x^2 - x - x + 1) + 5$
$y = -(x^2 - 2x + 1) + 5$
$y = -x^2 + 2x - 1 + 5$
$y = -x^2 + 2x + 4$

Y-int: $(0, 4)$

$1 \quad 3 \quad 5$
$.5 \quad 1.5 \quad 2.5$

5) $f(x) = -2(x+1)^2 + 8$ $(-1, 8)$

$1 \quad 3 \quad 5$
$-2 \quad -6 \quad -10$

Standard form:
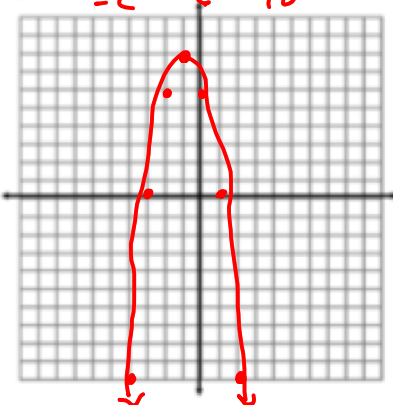$y = -2(x+1)(x+1) + 8$
$y = -2(x^2 + x + x + 1) + 8$
$y = -2(x^2 + 2x + 1) + 8$
$y = -2x^2 - 4x - 2 + 8$
$y = -2x^2 - 4x + 6$

Y-int: $(0, 6)$

6) $f(x) = 0.5(x-4)^2 - 6$ $(4, -6)$

Standard form:
$y = .5(x-4)(x-4) - 6$
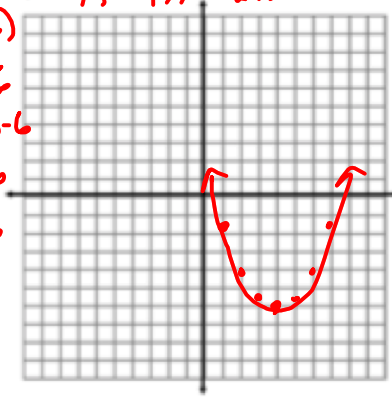$y = .5(x^2 - 4x - 4x + 16) - 6$
$y = .5(x^2 - 8x + 16) - 6$
$y = 0.5x^2 - 4x + 8 - 6$
$y = 0.5x^2 - 4x + 2$

Y-int: $(0, 2)$

7) $f(x) = (x+6)^2 + 0$ $(6, 0)$

Standard form:
$y = (x+6)(x+6)$
$y = x^2 + 12x + 36$

Y-int: $(0, 36)$

8) $f(x) = -(x)^2 + 5$ $-(x-0)^2 + 5$

Standard form:
$y = -x^2 + 5$

Y-int: $(0, 5)$

9) $f(x) = (2x - 4)^2 - 9$

(handwritten) $(4, -9)$ 1 3 5
                          2 6 10
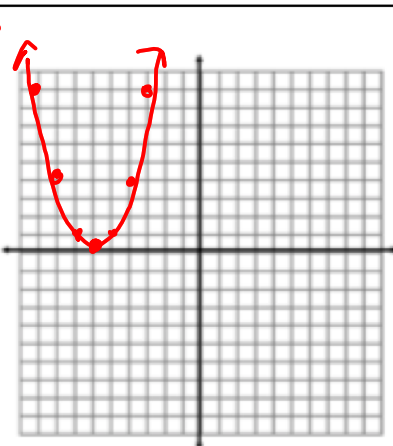
Standard form:

$Y = 2(x-4)(x-4) - 9$

$Y = 2(x^2 - 8x + 16) - 9$

$Y = 2x^2 - 16x + 32 - 9$

$Y = 2x^2 - 16x + 23$

Y-int: $(0, 23)$

10) $f(x) = -0.5(x + 7)^2 + 7$

(handwritten) $(-7, 7)$ -.5 -1.5 -2.5

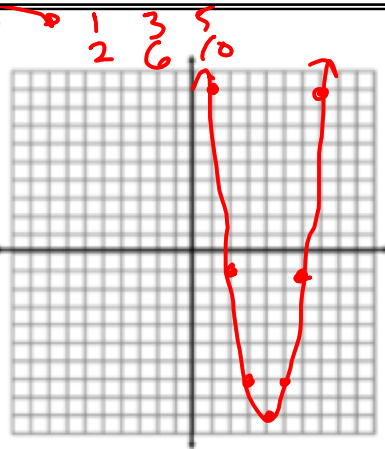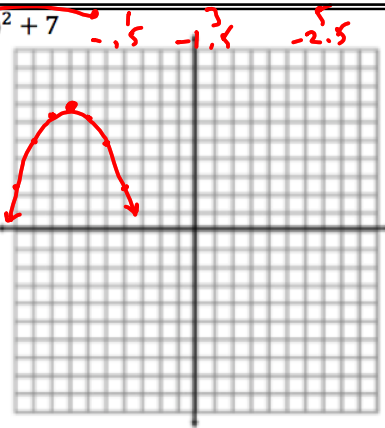Standard form:

$Y = -.5(x+7)(x+7) + 7$

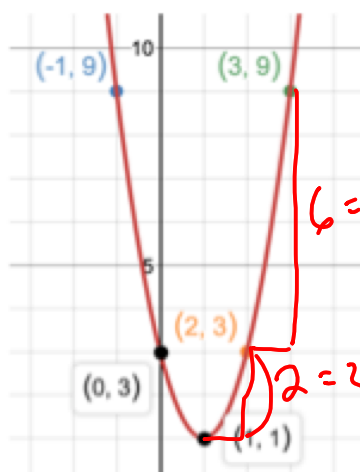$Y = -.5(x^2 + 14x + 49) + 7$

$Y = -.5x^2 - 7x - \frac{49}{2} + 7$

$Y = -.5x^2 - 7x + 17.5$

Y-int: $(0, 17.5)$

Directions: a) Write the equation of each function. b) Compare the graph to the given function.

11)

(-1, 9)   10   (3, 9)

(2, 3)

(0, 3)

(1, 1)

$6 = 1 \times 3$

$2 = 2 \times 1$

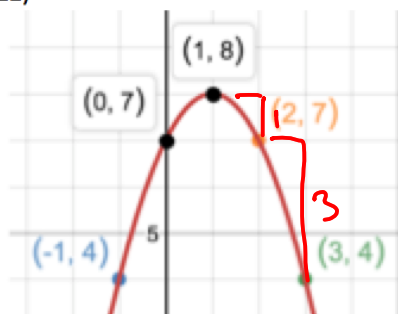a) What is the equation of the function?

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

b) Compare the graph to $f(x) = (x - 1)^2 - 1$

The graph is skinnier because the leading coefficient is bigger.

The graph's minimum value is y=1, which is higher than the equation's of y = -1.

They both have the same x-value for the vertex.

12)

(1, 8)

(0, 7)   (2, 7)

(-1, 4)   5   (3, 4)

3

a) What is the equation of the function?
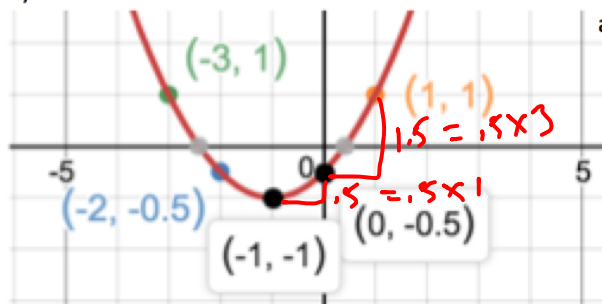
$Y = -(x-1)^2 + 8$

b) Compare the graph to $f(x) = (x - 1)^2 - 1$

They both have the same x-value for the vertex.

The graph opens down instead of up for the equation.

The graph has a higher minimum value (y=8), compared to the equation's (y = -1)

13)

(-3, 1)

(1, 1)

-5   0   5

(-2, -0.5)

(0, -0.5)

(-1, -1)

$1.5 = .5 \times 3$

$.5 = .5 \times 1$

a) What is the equation of the function?

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

b) Compare the graph to $f(x) = (x - 1)^2 - 1$

The graph is wider than the equation because the leading coefficient is smaller than the equations.

The x-value of the vertex of the graph is -1 instead of the equations (x = 1)

Use the piecewise function to evaluate the following.

14) $f(x) = \begin{cases} -2x^2 - 1, & x \leq 2 \\ \frac{4}{5}x - 4, & x > 2 \end{cases}$

a) $f(0) = -2(0)^2 - 1$

$0 - 1$

$\boxed{-1}$

b) $f(5) =$

$\frac{4}{5}(5) - 4$

$4 - 4 = \boxed{0}$

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

$-2(4) - 1$

$-8 - 1$

$\boxed{-9}$

d) $f(-3) = -2(-3)^2 - 1$

$-2(9) - 1$

$-18 - 1$

$\boxed{-19}$

Directions: Factor.

15) $3x^2 + 10x - 8$

-24

$12 \times -2 \times 3$

$3x^2 + 12x - 2x - 8$

$3x(x+4) - 2(x+4)$

$\boxed{(3x-2)(x+4)}$

16) $h^2 + 3h - 54$

-54

$\boxed{(h-6)(h+9)}$ $9 \times -6 \times 3$

17) $6x^2 - 15x - 36$

$3(2x^2 - 5x - 12)$

-24

$-8 \times 3 \times -5$

$3(2x^2 - 8x + 3x - 12)$

$3(2x(x-4) + 3(x-4))$

$\boxed{3(2x+3)(x-4)}$