Homework Review - 10.1

$$y = -\frac{1}{5}x^2$$

- reflection
- vertical shrink

$y = x^2$
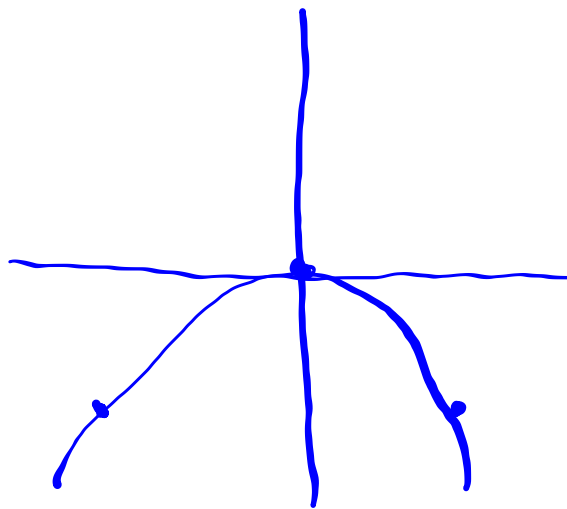
x	y
0	0
5	-5
-5	-5

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

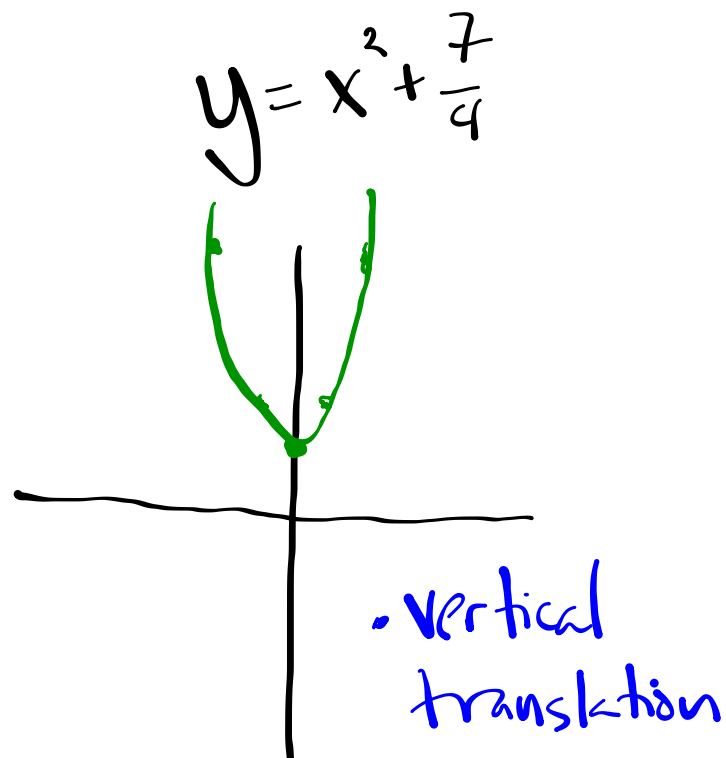$$-\frac{1}{5} \cdot 25$$

$$\frac{-25}{5} = -5$$

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

$$-\frac{1}{2} \cdot 25$$

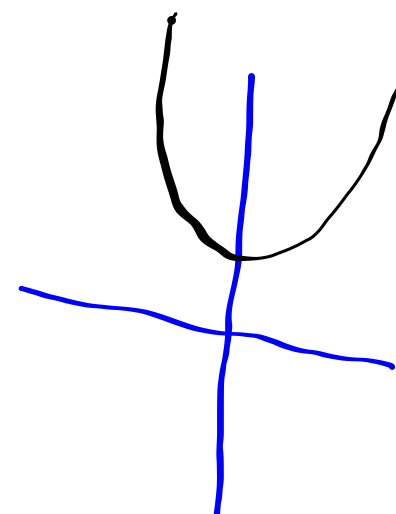$$-5 \cdot -5 = 25$$

$$-\frac{1}{5}x^2 \qquad \text{when } x=5$$

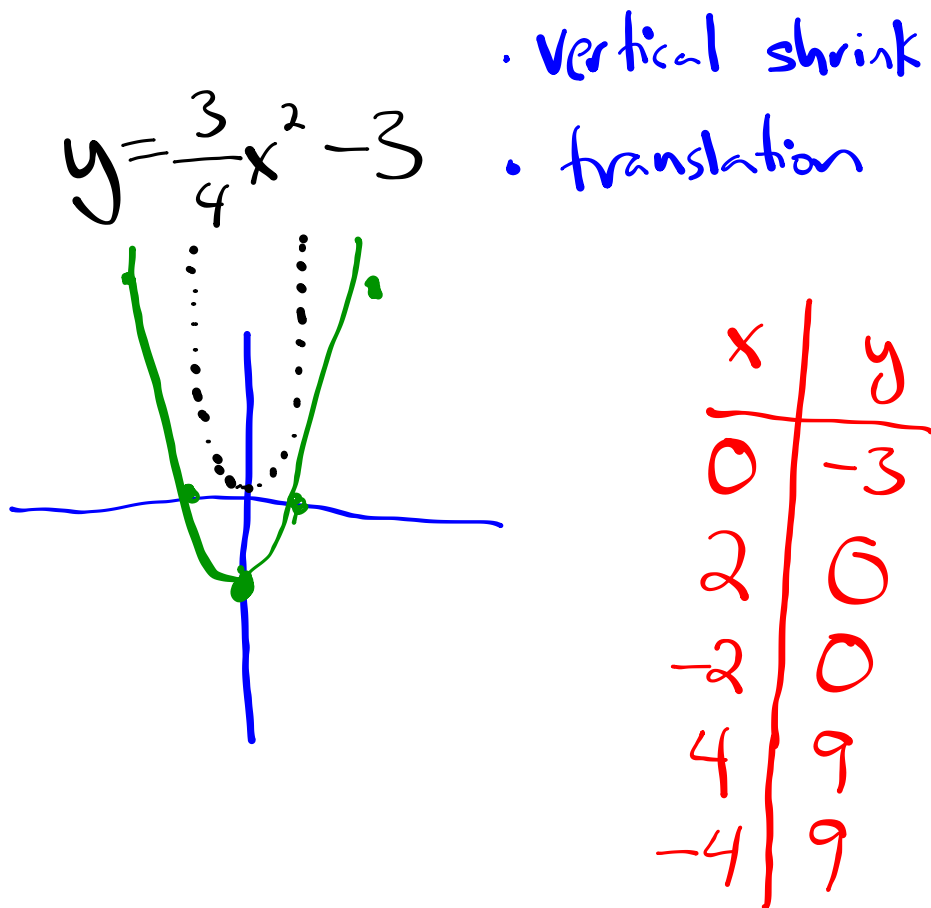$$-\frac{1}{5}(5)^2 = -\frac{1}{5} \cdot 25 = \frac{-25}{5} = -5$$

$$y = x^2 + \frac{7}{4}$$

- Vertical translation

x	y	
0	$\frac{7}{4}$	$1\frac{3}{4}$
1	$\frac{11}{4}$	$2\frac{3}{4}$
-1	$\frac{11}{4}$	$2\frac{3}{4}$
2	$\frac{23}{4}$	$5\frac{3}{4}$
-2	$\frac{23}{4}$	$5\frac{3}{4}$

$$\frac{4}{4} + \frac{7}{4} = \frac{11}{4}$$

$$\frac{16}{4} + \frac{7}{4} = \frac{23}{4}$$

$$y = \frac{3}{4}x^2 - 3$$

- Vertical shrink
- translation

x	y
0	-3
2	0
-2	0
4	9
-4	9

$$(-1, 9) \quad (0, 3)$$

$$y = ax^2 + 3$$

$$9 = a(-1)^2 + 3$$

$$9 = a + 3$$

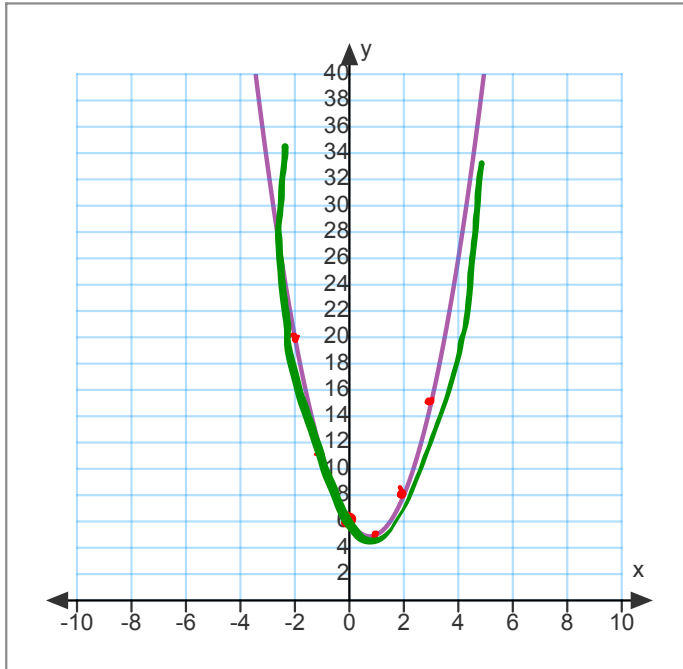$$-3 \qquad -3$$

$$a = 6$$

$$y = ax^2 + c$$

$$3 = a(0)^2 + c$$

$$3 = 0 + c$$

$$3 = c$$

$$y = 6x^2 + 3$$

Graphing Quadratics - $y = ax^2 + bx + c$

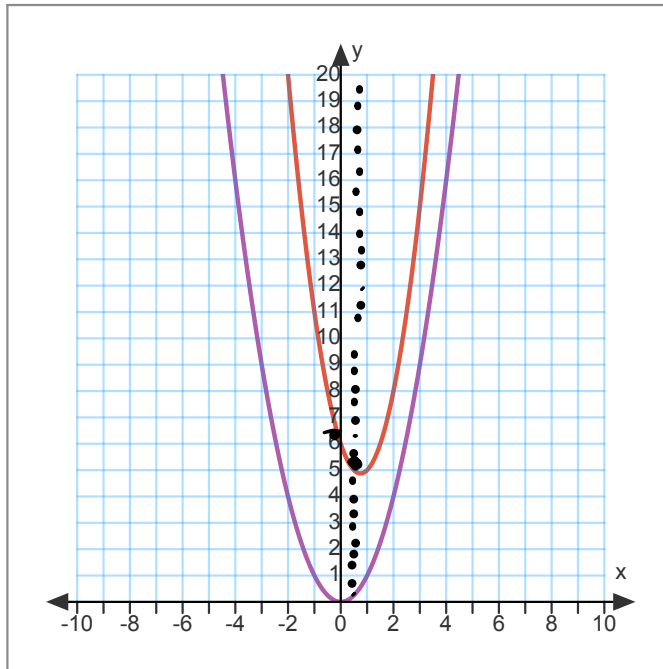**What will it look like?**

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

x	y
0	6
1	5
-1	11
2	8
-2	20
3	15

General Guidelines:

$$y = x^2$$

$$y = ax^2 + bx + c$$
$$y = 2x^2 - 3x + 6$$

$$\sim 1 - \sim 2 + 6$$
$$\frac{9}{8} - \frac{18}{8} + \frac{48}{8}$$

Does it open up or down? (Smiley or Frowny)

if a is negative, it's frowny ...

Is it narrower or wider than the parent function?

if $|a| < 1$, it's wider (vertical shrink

Where is the axis of symmetry?

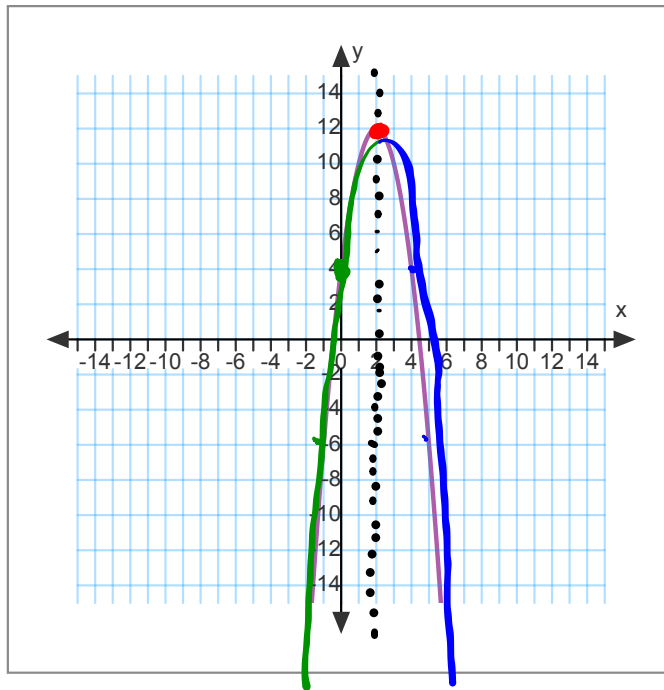$$x = \frac{-b}{2a} = \frac{3}{4}$$

Where is the vertex?

↳ Use this x and find $\left(\frac{3}{4}, 5\right)$ y using the equation

Where is the y-intercept?

Use x = 0 and find y using the equation

Graph $y = ax^2 + bx + c$

$y = -2x^2 + 8x + 4$

smile   frown

1. Determine whether the graph opens up or down

DOWN

2. Find and sketch the axis of symmetry

$x = \dfrac{-b}{2a} = \dfrac{-8}{2(-2)} = \dfrac{-8}{-4} = 2$

3. Find and plot the vertex

$y = -2(2)^2 + 8(2) + 4$
$= -8 + 16 + 4 = 12$ $(2, 12)$

4. Plot two points - the y-intercept and one other
point (on the same side of the parabola)

$y = -2(-1)^2 + 8(-1) + 4$

5. Reflect the other side of the parabola

6. Draw the curve

x	y
0	4
-1	-6

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

a

$$x = \frac{-b}{2a} = 0$$

$$y = \frac{-2}{3}(0)^2 - 1$$

$$y = -1$$

axis: $x = 0$

Vertex: $(0, -1)$

$y = mx + b$

$y = b \Leftarrow$ horizontal line

$x = a \Leftarrow$ vertical line

$$y = -3x^2 + 24x - 22$$

$$x = \frac{-b}{2a} = \frac{-24}{2(-3)} = \frac{-24}{-6} = 4$$

$$y = -3(4)^2 + 24(4) - 22$$
$$= -48 + 96 - 22$$
$$= 26$$

$$(4, 26) \rightarrow \text{vertex}$$
$$x = 4 \quad \rightarrow \text{axis}$$

$$y = -\frac{1}{4}x^2 + 3x - 2$$

$$x = \frac{-b}{2a} = \frac{-3}{2(-\frac{1}{4})} = \frac{-3}{-\frac{1}{2}}$$

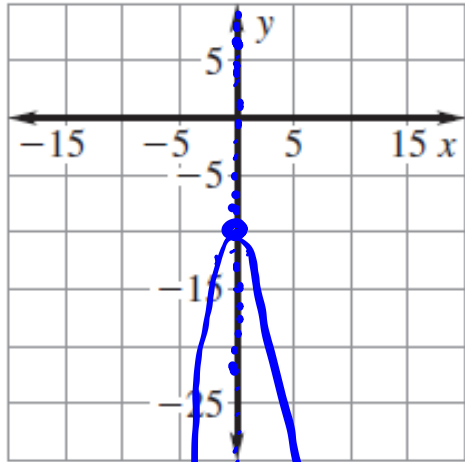$$\frac{-3}{1} \div \frac{-1}{2} = \frac{+3}{1} \cdot \frac{2}{+1} = 6$$

$$y = -\frac{1}{4}(6)^2 + 3(6) - 2$$
$$= 9 + 18 - 2$$
$$= 25$$

Vertex: $(6, 25)$
axis: $x = 6$

$y = -x^2 - 10$

$= -x^2 + 0x - 10$

1. Frowny / smiley?
2. Same width as parent
3. $x = \frac{-b}{2a} = \frac{-0}{2(-1)} = 0$
4. $y = -(0)^2 + 0(0) - 10$
   $y = -10 \quad (0, -10)$
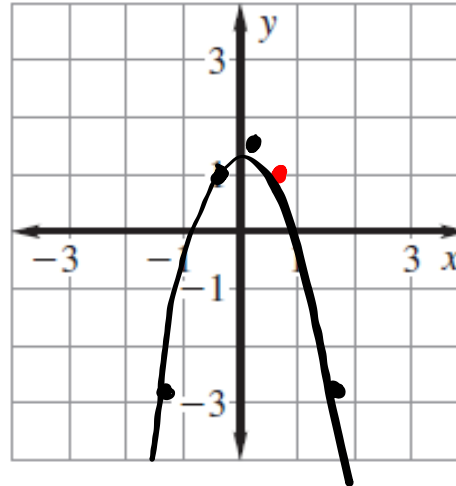5. $y = -(5)^2 - 10$
   $= -35 \quad (5, -35)$
   $y = -(1)^2 - 10$
   $= -11 \quad (1, -11)$

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

$x = \frac{-b}{2a} = \frac{-2}{2(-2)}$

$= \frac{-2}{-4} = \frac{1}{2}$

$y = -2\left(\frac{1}{2}\right)^2 + 2\left(\frac{1}{2}\right) + 1$

$= -\frac{1}{2} + 1 + 1$

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

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

$y = -2(2)^2 + 2(2) + 1$
$= -8 + 4 + 1$
$= -3$

Finding the maximum or minimum of a quadratic

If the graph opens up, it has a minimum.

If the graph opens down, it has a maximum. } VERTEX

Find the vertex and identify it as a minimum or maximum:
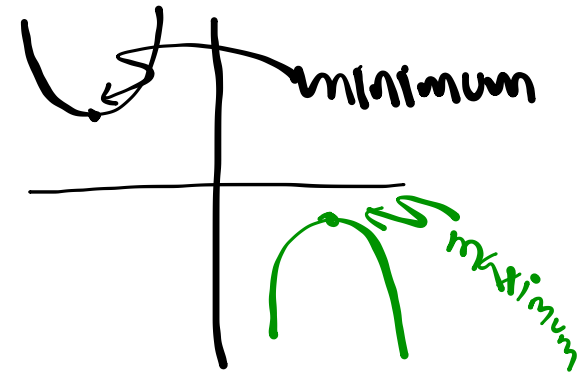
$$y = -\frac{1}{2}x^2 + 2x - 4$$

'Find the vertex →

$$x = \frac{-b}{2a} = \frac{-2}{2\left(-\frac{1}{2}\right)} = \frac{-2}{-1} = 2$$

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

$$= -2 + 4 - 4 = -2$$

$(2, -2) = $ maximum

(a is negative so it's a frowney face)

minimum

maximum

32. $f(x) = 8x^2 - 40$ $\boxed{f(x) = y}$ **33.** $f(x) = -5x^2 + 10x - 2$

$y = 8x^2 - 40$

$y = -5x^2 + 10x - 2$

vertex

Find the minimum or maximum
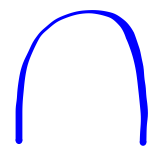
$x = \dfrac{-b}{2a} = \dfrac{-0}{2(8)} = 0$

$y = 8(0)^2 - 40 = -40$

$(0, -40)$ minimum

$x = \dfrac{-b}{2a} = \dfrac{-10}{2(-5)} = 1$

$y = -5(1)^2 + 10(1) - 2$

$= -5 + 10 - 2$

$= 3$

$(1, 3)$ maximum

Storage Building The storage building shown can be modeled by the graph of the function $y = -0.12x^2 + 2.4x$ where x and y are measured in feet. What is the height h at the highest point of the building as shown in the diagram?
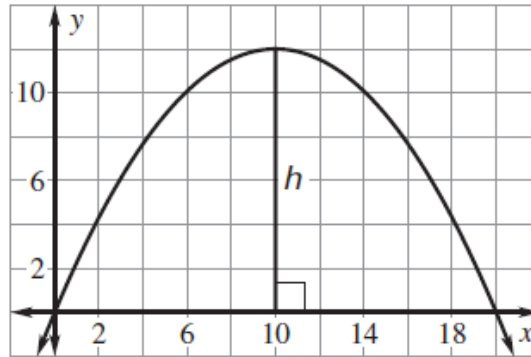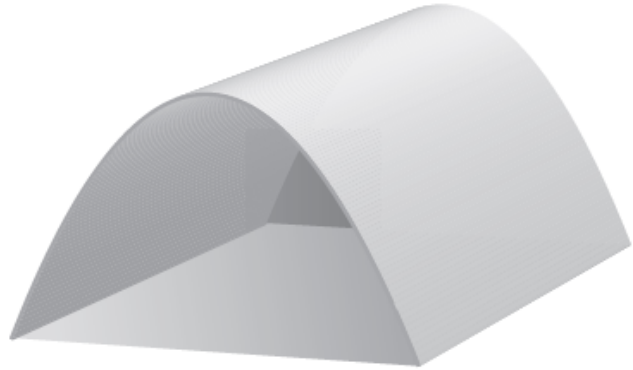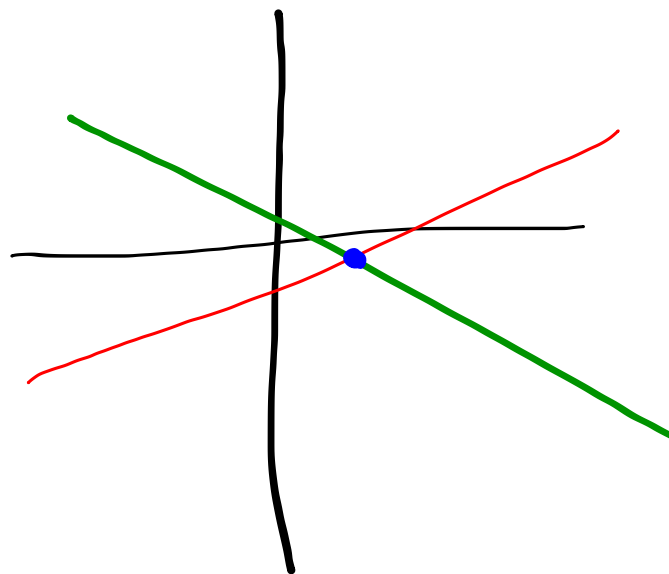
Homework:

p. 638, 3-11 odd, 15-24 by 3, 28-34 by 3, 40, 41

5/16

5/17

Questions on homework

Practice work sample (linear systems)

$$2x + 4y = 19$$
$$y = [5x - 6]$$

$$2x + 4(5x - 6) = 19$$
$$2x + 20x - 24 = 19$$
$$\vdots$$