For Exercises 1–6, use the information shown in the figure below.
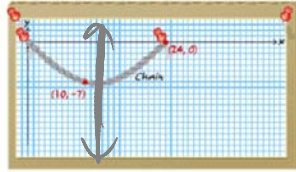
1. What is the equation of the parabola in the form $y = ax(x - d)$?
2. Use the Distributive Property to rewrite your equation from Exercise 1 in the form $y = ax^2 + bx$.
3. Does your equation represent a quadratic function? Explain.
4. Use one of your equations to find the coordinates of the vertex of the parabola.
5. Describe where the axis of symmetry in the parabola is located. Find its equation.

1. Using $y = ax(x-d)$

$d = 24$ Find a: $-7 = a \cdot 10(10-24)$
$x = 10$ $-7 = 10a(-14)$
$y = -7$ $-7 = -140a$
                     $a = .05$

$$\boxed{y = .05x(x-24)}$$

2. $y = .05x(x-24)$

$$\boxed{y = .05x^2 - 1.2x}$$

3. Yes! It is of the form $y = ax^2 + bx + c$, with $a = .05, b = -1.2, c = 0$.

4. Since $x = 12$ ... plug in $y = .05(12)(12-24)$
   $= .6(-12)$
   $= -7.2$

$$\boxed{\text{Vertex: } (12, -7.2)}$$

5. The axis of symmetry is a vertical line passing through the vertex $(12, -7.2)$. The eqn. is $\boxed{x = 12.}$

6. Which of these points lie on the parabola?

   $(4, -4)$ $(8, -6)$ $(14, -7)$ $(18, -5.4)$ $(20, 4)$

7 a. Find an equation of a quadratic function that passes through the following points: the origin, $(5, 0)$, and $(2, 6)$.
   b. Does the graph open upward or downward?
   c. What do you notice about the coefficient of the x^2 term of your equation?

6. $(\overset{x}{4}, \overset{y}{-4})$

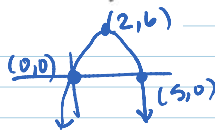 $-4 \overset{?}{=} .05(4)^2 - 1.2(4)$
   $-4 = -4$ ☺

   $(4, -4)$ is on the parabola.
   Check the other points...
   $(14, -7)$ and $(18, -5.4)$ are also on the parabola.

$y = ax(x - d)$

7a) $d = 5$ $x = 2$ $y = 6$
   $6 = 2a(2-5)$
   $6 = 2a(-3)$
   $6 = -6a$
   $\boxed{a = -1} \longrightarrow \boxed{y = -x(x-5)}$

b.) Downward
c.) a is negative

8. The equation of a quadratic function that passes through the origin is $y = 5x(x - 25)$.

2 units to Right... $(x-2)$
8.) a.) $y = 5(x-2)[(x-2)-25]$
     $y = 5(x-2)(x-27)$

8. The equation of a quadratic function that passes through the origin is $y = 5x(x - 25)$.
  a. Suppose the graph of the original function is translated 2 units to the right. Find an equation of the new function.
  b. Suppose the graph of the original function is translated 3 units to the left. Find an equation of the new function.
  c. Suppose the graph of the original function is translated h units horizontally. Find an equation of the new function.

9. It is very difficult to just look at a graph and tell whether it is or is not a parabola because not all U-shaped graphs are parabolas.
  a. On the same set of axes, graph the functions $y = x$, $y = x^2$, $y = x^3$, $y = x^4$, and $y = x^5$.
  b. What do you notice about these graphs?
  c. Using your observations, how would you expect the graph of $y = x^6$ to look?

8.) a.) $y = 5(x-2)[(x-2)-25]$

$$y = 5(x-2)(x-27)$$

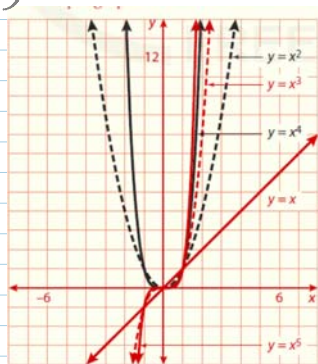b.) 2 units to left... $(x+3)$

$$y = 5(x+3)[(x+3)-25]$$

$$y = 5(x+3)(x-22)$$

c.) h units horizontally... $(x-h)$

$$y = 5(x-h)[(x-h)-25]$$

$$y = 5(x-h)(x-h-25)$$

9.)

9b.) All but $y = x$ are curves. Every graph passes through the origin and $(1,1)$.
   If even power (exponent) $\Rightarrow$ "u" shaped
   If odd power $\Rightarrow$ not "u" shaped

9c) $y = x^6$ would look like a "U", opening up, but narrower than the others.