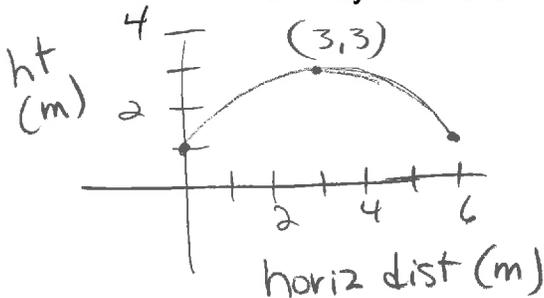


**Writing Quadratic Functions FOR REAL** (for real life situations)  
(for more info see p. 154-156)

We've already learned how to write a quadratic function based on a graph. Now we will apply this concept to real life situations! ☺

- Suppose Mr. Roberts picks up his cat Max and throws her across the room, releasing her at a height of 1 meter. While flying through the air, Max reaches a maximum height of 3 meters and then lands softly on the couch 6 meters away, which is also 1 meter off the ground. (Remember that ALL objects, while flying through the air, will follow a path that makes a nice parabolic shape)

- Model the path of Mr. Robert's cat with a quadratic function in vertex form. You may want to draw a diagram.



$$V(3, 3) \quad p=3 \quad q=3$$

point (0, 1) Set  $x=0$ ,  $y=1$  and find  $a$ .

$$y = a(x-3)^2 + 3$$

$$1 = a(0-3)^2 + 3$$

$$-2 = 9a$$

$$a = -\frac{2}{9}$$

$$y = -\frac{2}{9}(x-3)^2 + 3$$

- What is the height of Mr. Roberts' cat when it is 5 meters away from him horizontally? Hint:  $x=5$

$$y = -\frac{2}{9}(5-3)^2 + 3$$

$$y = -\frac{2}{9}(4) + 3$$

$$y = -\frac{8}{9} + \frac{27}{9}$$

$$y = \frac{19}{9}$$

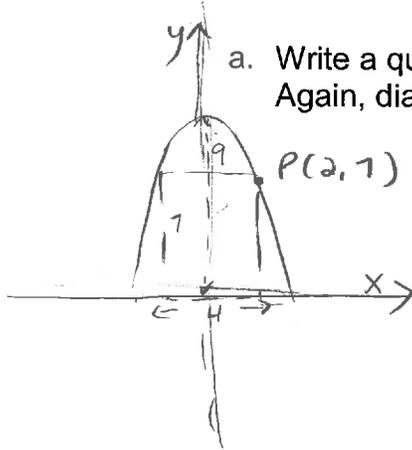
or 2.11 m.

- State the domain and range for this particular situation.

domain:  $0 \leq x \leq 6$

range:  $1 \leq y \leq 3$

2. Mr. Roberts is going to build a beautiful wooden archway in his backyard. The archway will have a maximum height of 9 feet. For practical purposes, he would like to be able to fit a rectangular shape through the archway that is 7 feet tall and 4 feet wide.



- a. Write a quadratic function to model the archway that Mr. Roberts will build. Again, diagrams usually help.

$$V: (0, 9) \quad p = 0 \quad q = 9$$

$$P: (2, 7) \quad x = 2 \quad y = 7$$

$$y = a(x - 0)^2 + 9$$

$$7 = a(2)^2 + 9$$

$$-2 = 4a$$

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

$$y = -\frac{1}{2}x^2 + 9$$

- b. Determine whether the base of the arch will be more than 6 feet wide or not. Hint: Find the x-int. ( $y=0$ )

$$0 = -\frac{1}{2}x^2 + 9$$

$$-9 = -\frac{1}{2}x^2$$

$$18 = x^2 \quad x = \pm\sqrt{18} \approx \pm 4.243$$

$$\text{Base} = 2x \\ \approx 8.485 \text{ ft.}$$

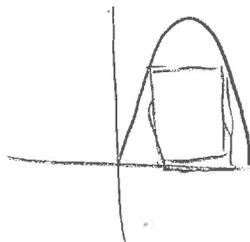
Yes; greater than 6 ft.

- c. State the domain and range for this situation.

$$\text{domain: } -4.243 \leq x \leq 4.243$$

$$\text{range: } 0 \leq y \leq 9$$

Note: If



$$\text{domain: } 0 \leq x \leq 8.485$$