

## Math 98 Worksheet #7 Solutions

1. Walking along the edge of a cliff 64 feet high, you notice a cannon loaded with a cannonball. Feeling rebellious and seeing that there is no one in the area below, you decide to fire the cannonball. Knowing some physics, you find that the height (in feet) of the cannonball above the ground at a given time  $t$  (in seconds) is modeled by the function  $s(t) = -16t^2 + 32t + 64$ .

- (a) How high above the ground is the cannonball after 1 second?

Since  $s(t)$ =height of cannonball at time  $t$ ,  $s(1)$ =height of cannonball at 1 second.

$$s(1) = -16(1)^2 + 32(1) + 64 = -16 + 32 + 64 = 80 \text{ feet}$$

- (b) At what time(s) is the cannonball 64 feet above the ground?

We are looking for time(s)  $t$  such that  $s(t) = 64$ .

$$64 = -16t^2 + 32t + 64 \Rightarrow 0 = -16t^2 + 32t$$

$$0 = -16t(t - 2)$$

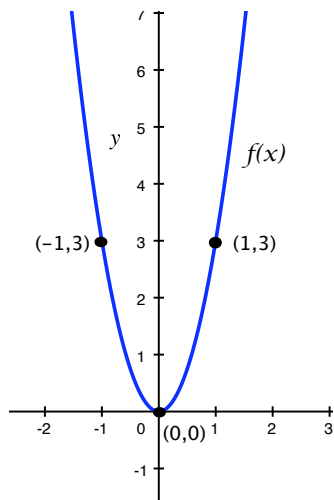
$$\text{So, either } -16t = 0 \text{ or } t - 2 = 0 \Rightarrow t = 0 \text{ or } t = 2$$

The cannonball is 64 feet above the ground at  $t = 0$  seconds and  $t = 2$  seconds.

2. Graph the following quadratic functions. State the vertex, axis of symmetry, domain, and range.

(a)  $f(x) = 3x^2$

$x$	$y = 3x^2$
-2	$3(-2)^2 = 12$
-1	$3(-1)^2 = 3$
0	$3(0)^2 = 0$
1	$3(1)^2 = 3$
2	$3(2)^2 = 12$



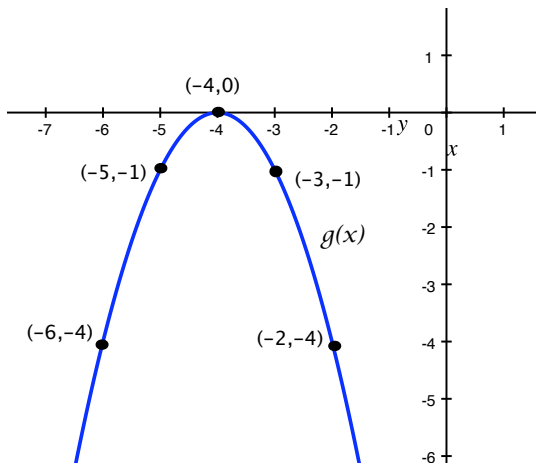
Vertex:  $(0, 0)$

Axis of Symmetry:  $x = 0$

Domain:  $(-\infty, \infty)$

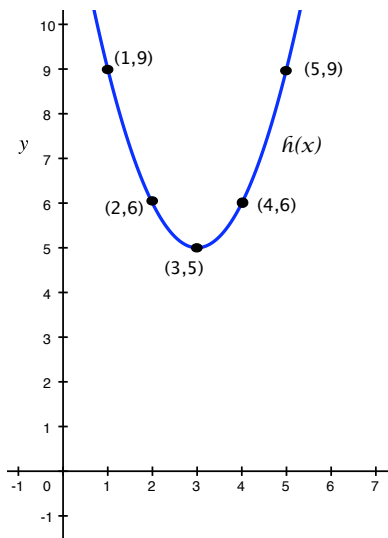
Range:  $[0, \infty)$

(b)  $g(x) = -(x + 4)^2$



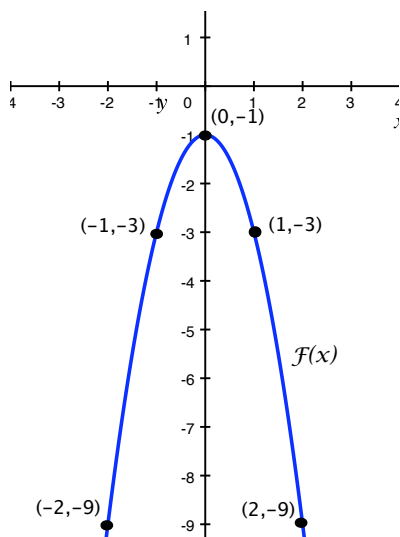
Vertex:  $(-4, 0)$   
Axis of Symmetry:  $x = -4$   
Domain:  $(-\infty, \infty)$   
Range:  $(-\infty, 0]$

(c)  $h(x) = (x - 3)^2 + 5$



Vertex:  $(3, 5)$   
Axis of Symmetry:  $x = 3$   
Domain:  $(-\infty, \infty)$   
Range:  $[5, \infty)$

(d)  $F(x) = -2x^2 - 1$



Vertex:  $(0, -1)$   
Axis of Symmetry:  $x = 0$   
Domain:  $(-\infty, \infty)$   
Range:  $(-\infty, -1]$