Name: _____ Date: _____

UNIT 9 **LESSON** 9

DO NOW: The function $f(x) = 3x^2 + 12x + 11$ can be written in vertex form as

1) $f(x) = (3x + 6)^2 - 25$

2) $f(x) = 3(x + 6)^2 - 25$

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

4) $f(x) = 3(x + 2)^2 + 7$

$y_1 = 3x^2 + 12x + 11$

$y_2 = 3(x+2)^2 - 1$

AIM: ANALYZING QUADRATIC FUNCTIONS

1. Which quadratic function has the largest maximum?

a) $h(x) = (3 - x)(2 + x)$

x	y
-2	0
-1	6
0	6
1	6.25
2	6
3	4
4	0

b) $k(x) = -5x^2 - 12x + 4$

$x = \frac{-(-12)}{2(-5)} = -\frac{12}{10}$

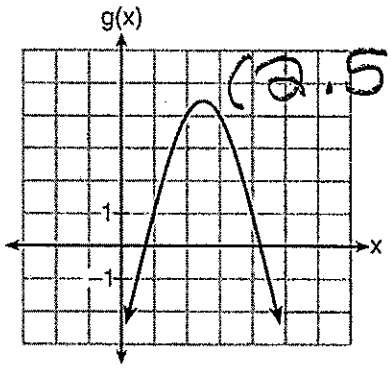
$k(-\frac{12}{10}) = -5(-\frac{12}{10})^2 - 12(-\frac{12}{10}) + 4$

$k(-\frac{12}{10}) = 11.2$

c)

x	f(x)
−1	−3
0	5
1	9
2	9
3	5
4	−3

d)



(2.5, 4.5)

2. A toy rocket is launched from the ground straight upward. The height of the rocket above the ground, in feet, is given by the equation $h(t) = -16t^2 + 64t$, where t is the time in seconds. Determine the domain for this function in the given context. Explain your reasoning.

$h(t) = -16t^2 + 64t$

$h(t)$ = height (range)

t = time (domain)

$\frac{0}{-16t} = \frac{-16t^2}{-16t} + \frac{64t}{-16t}$

x	y
0	0
1	48
2	64
3	48
4	0

$-16t(t - 4) = 0$

$-16t = 0$ | $t - 4 = 0$

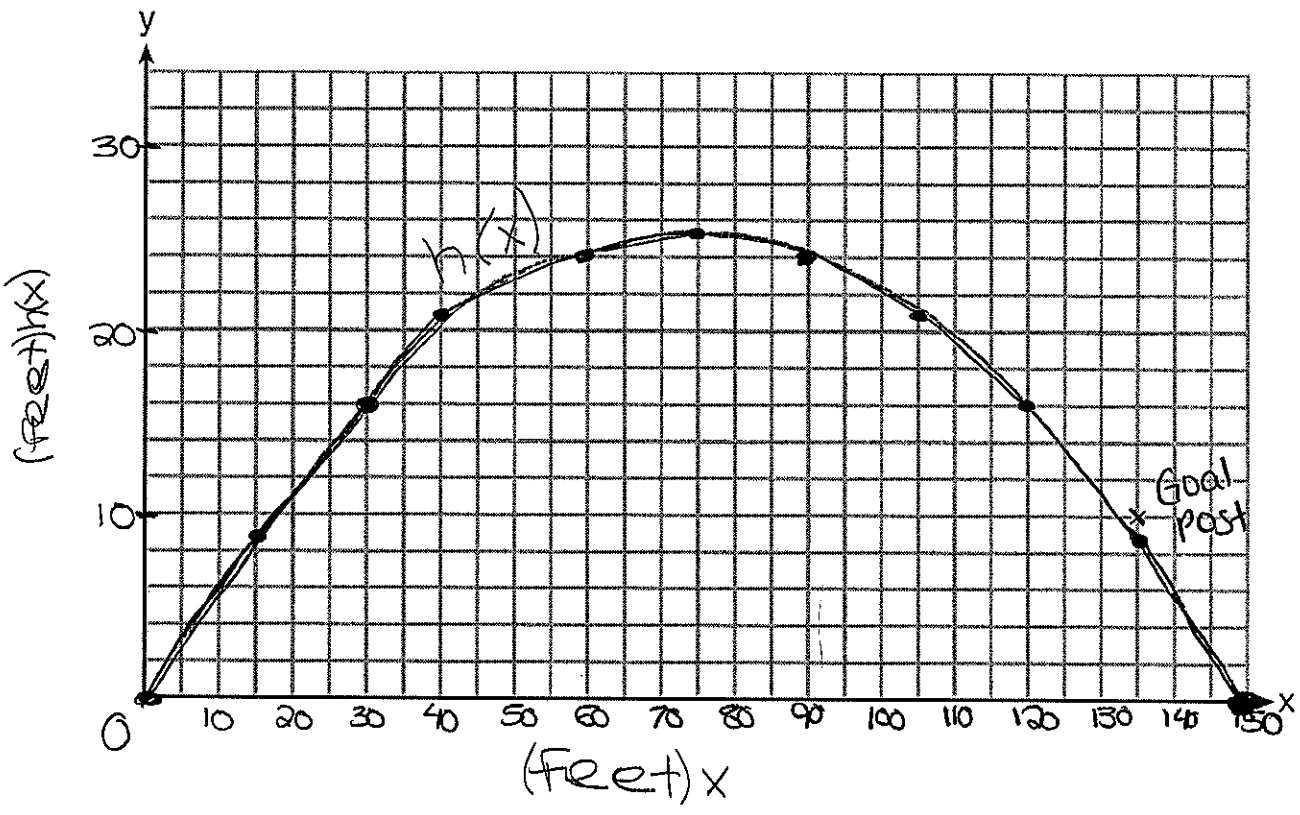
$\frac{-16t}{-16} = \frac{0}{-16}$ | $+4 \quad +4$

$t = 0 \quad t = 4$

$0 < t < 4$

3. A football player attempts to kick a football over a goal post. The path of the football can be modeled by the function $h(x) = -\frac{1}{225}x^2 + \frac{2}{3}x$, where x is the horizontal distance from the kick, and $h(x)$ is the height of the football above the ground, when both are measured in feet. On the set of axes below, graph the function $y = h(x)$ over the interval $0 \le x \le 150$.

x	y
0	0
15	9
30	16
45	21
60	24
75	25
90	24
105	21
120	16
135	9
150	0



a) Determine the vertex of $y = h(x)$. Interpret the meaning of this vertex in the context of the problem. The goal post is 10 feet high and 45 yards away from the kick.

Vertex is (75,25). After 75 feet the football reached it's maximum height of 25 feet

b) Will the ball be high enough to pass over the goal post? Justify your answer.

NO!
45 yards × 3 ft = 135 ft
At 135ft, the football is only 9ft high.

4. Let $h(t) = -16t^2 + 64t + 80$ represent the height of an object above the ground after t seconds.

a. Determine the number of seconds it takes to achieve its maximum height. Justify your answer.

$a = -16$

$b = 64$

$x = \frac{-(64)}{2(-16)}$

$x = \frac{-64}{-32}$

$x = 2$

X	Y
-1	0
0	80
1	128
2	144
3	128
4	80
5	0

height decreases

It takes two seconds to reach it's max height

b. State the time interval, in seconds, during which the height of the object *decreases*. Explain your reasoning.

$h(t) = -16t^2 + 64t + 80$

$\frac{0}{-16} = \frac{-16t^2}{-16} + \frac{64t}{-16} + \frac{80}{-16}$

$0 = -16(t^2 - 4t - 5)$

$0 = -16(t-5)(t+1)$

$-16 \neq 0 \quad | \quad t = 5 \quad | \quad t = -1$

* Look at table

$2 \leq t \leq 5$