Name:_____ Date:_____

UNIT 9 **LESSON 4.5**

Do Now: Find the vertex *algebraically*. $y = -6x^2 + 12x$

$a = -6$ $x = -\frac{(12)}{2(-6)}$ $y = -6(1)^2 + 12(1)$

$b = 12$ $y = 6$

$x = -\frac{12}{-12}$ Vertex (1, 6)

$x = 1$

Aim: Solving for the Vertex for Real Life Quadratic Functions

1. Ms. Cronin and Ms. Rohr are going to an amusement park. Their favorite ride is The Giant Trampoline. However, The Giant Trampoline is only allowed to be jumped once, per person. If the motion of Ms. Cronin's jump is represented by the equation $h(t) = -12t^2 + 54t$. Where t represents the time and $h(t)$ represents the height, in inches.

a) To the ~~*nearest hundredth*~~ of a second, how long does it take for Ms. Cronin to reach her maximum height?

b) To the ~~*nearest hundredth*~~ of an inch, what is the maximum height that Ms. Cronin jumped?

$a = -12$ $x = -\frac{(54)}{2(-12)}$

$b = 54$

$x = -\frac{54}{-24}$

$x = 2.25$ max time: 2.25 seconds

$h(2.25) = -12(2.25)^2 + 54(2.25)$

$h(2.25) = 60.75$ max height: 60.75 inches

2. Harrison is a football player for Calhoun Colts. He is the team's number one kicker. The winning field goal was made my him and is represented by the equation: $p(x) = -6x^2 + 40x$. Where $p(x)$ is the height in yards and x is the time in seconds.

   a. To the *nearest tenth* of a second, how long does it take for the football to reach its, maximum height?
   b. To the *nearest tenth* of a yard, what is the maximum height of the football after the kick?
   c. To the *nearest tenth* of a second, determine how long it takes for the football to touch the ground after it has been kicked?

(a) $a=40$, $b=-6$

$$x = \frac{-(40)}{2(-6)} = \frac{-40}{-12} = 3.3$$

3.3 seconds

(b) $p(3.3) = -6(3.3)^2 + 40(3.3)$

$p(3.3) = 112.2$

66.6 yards

(c) $p(x) = -6x^2 + 40x$

$0 = -6x^2 + 40x$

$a=-6$, $b=40$, $c=0$

$$x = \frac{-(40) \pm \sqrt{(40)^2 - 4(-6)(0)}}{2(-6)}$$

$$x = \frac{-40 \pm \sqrt{1600}}{-12}$$

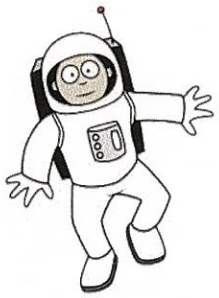
$$x = \frac{-40 \pm 40}{-12}$$

$$\frac{-40+40}{-12}, \quad \frac{-40-40}{-12}$$

$0, 6.666667$

6.7 seconds

3. Carly, as an American Astronaut, was working on a space station on the moon and decided to toss a moon rock into the air. The height of the ball is represented the by the equation $h(t) = -2.7t^2 + 13t + 14$ Where t represents the number of seconds since the moon rock was tossed and $h(t)$ represents the height of the moon rock in feet.



a) To the *nearest hundredth* of a second, after how much time does it take for the moon rock to hit the ground?

b) To the *nearest hundredth* of a foot, what is the maximum height of the moon rock?

$a = -2.7$

$b = 13$

$x = \frac{-(13)}{2(2.7)} = \frac{-13}{-5.4} = 2.407407407$

2.41 seconds

$h(2.41) = -2.7(2.41)^2 + 13(2.41) + 14$

$h(2.41) = 29.6483$

$h(2.4) = 29.65$

29.65 Ft

4. Paul launched a model rocket from ground level. At t seconds after it is launched, it is h(t) meters above the ground, which is represented by the equation: $h(t) = -4.9t^2 + 68.8t$.

a) To the nearest meter, what is the maximum height, attained by the model rocket?

b) To the nearest second, how long does it take the model rocket to reach the ground after it was launched?

$a = -4.9$

$b = 68.8$

$x = \frac{-(68.8)}{2(-4.9)} = \frac{-68.8}{-9.8} = 7.020408163$

7 seconds

$h(7) = -4.9(7)^2 + 68.8(7)$

$h(7) = 241.5$

242 meters