ALGEBRA RH HW

1. Jason jumped off of a cliff into the ocean in Acapulco while vacationing with some friends. His height as a function of time could be modeled by the function $h(t) = -16t^2 + 16t + 480$, where t is the time in seconds and h is the height in feet.

t = time (seconds)
h = height (feet)

a. How long did it take for Jason to reach his maximum height?

x value of vertex 0.5 seconds $x = \frac{-b}{2a}$ $x = \frac{-16}{2(-16)} = \frac{1}{2} = .5$

b. What was the highest point that Jason reached?

y value of vertex 484 feet

$h(0.5) = -16(0.5)^2 + 16(0.5) + 480$
$= 484$

c. Jason hit the water after how many seconds?

root (x intercept) 6 seconds

$0 = -16t^2 + 16t + 480$
$0 = -16(t^2 - t - 30)$
$0 = -16(t-6)(t+5)$
$t-6=0 \mid t+5=0$
$t=6 \mid t=-5$ reject

2. If a toy rocket is launched vertically upward from ground level with an initial velocity of 128 feet per second, then its height *h* after *t* seconds is given by the equation $h(t) = -16t^2 + 128t$ (if air resistance is neglected).

t = time (seconds)
h = height (feet)

a. How long will it take for the rocket to return to the ground?

root (x-intercept) 8 seconds

$0 = -16t^2 + 128t$
$0 = -16t(t-8)$
$-16t=0 \mid t-8=0$
$t=0 \mid t=8$
reject

b. After how many seconds will the rocket be 112 feet above the ground?

h(t) value

$112 = -16t^2 + 128t$
$16t^2 - 128t + 112 = 0$
$16(t^2 - 8t + 7) = 0$
$(t-7)(t-1) = 0$
$t-7=0 \mid t-1=0$
$t=7 \mid t=1$
at 1 second and also at 7 seconds

c. How long will it take the rocket to hit its maximum height?

x value of vertex

$x = \frac{-b}{2a}$
$x = \frac{-128}{2(-16)}$
$x = 4$ seconds

d. What is the maximum height?

y value of vertex

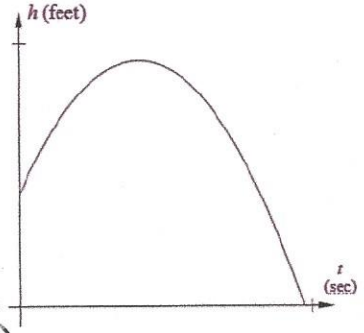
$h(4) = -16(4)^2 + 128(4)$
$= 256$
256 feet

3. A ball is shot out of a homemade air cannon. It flies through the air such that its height as a function of time is given by:

$h = -16t^2 + 64t + 10$

h = height (ft)
t = time (seconds)

where h is the height of the ball in feet and t is the time since it was fired in seconds.



Max estimates that it takes 4 seconds for the ball to hit the ground and Cole estimates it takes 5 second. Algebraically determine who is closer and support your answer.

$-16t^2 + 64t + 10 = 0$

$a = -16$
$b = 64$
$c = 10$

$t = \dfrac{-64 \pm \sqrt{(64)^2 - 4(-16)(10)}}{2(-16)}$

$t = \dfrac{-64 + \sqrt{4736}}{-32} = -0.15$ seconds (reject)

$t = \dfrac{-64 - \sqrt{4736}}{-32} = 4.15$ seconds

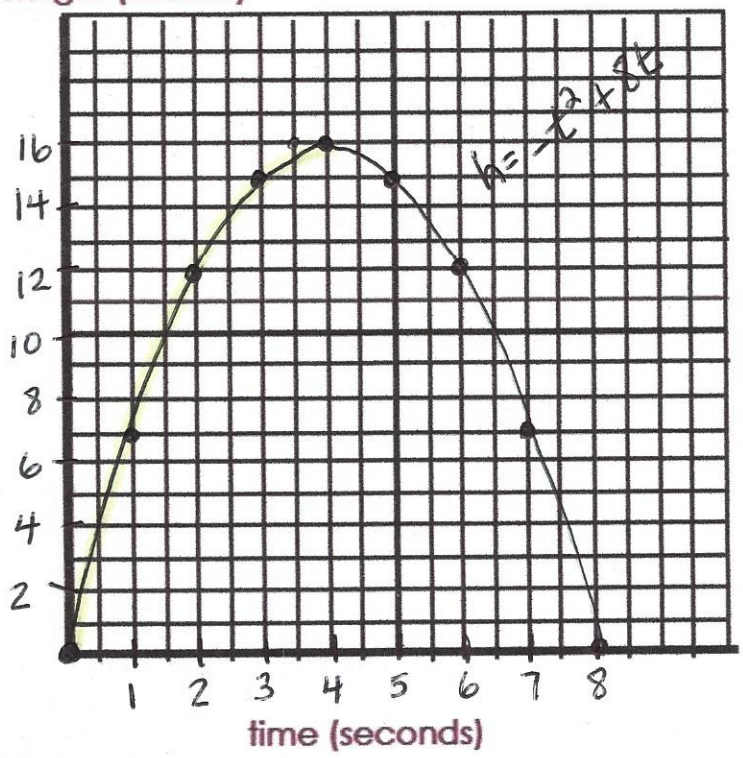
Max's estimate is more correct. 4.15 is closer to 4 than 5.

4. A soccer ball is kicked into the air. The path of the ball is modeled by the equation $h = -t^2 + 8t$, where h is the height of the ball in feet and t is the time in seconds.

t	0	1	2	3	4	5	6	7	8
h	0	7	12	15	16	15	12	7	0

Graph the function on the coordinate plane below.

Soccer Ball Path



a. What is the maximum height of the ball?
y value of vertex
16 feet

b. When does it hit its maximum height?
x value of vertex
4 seconds

c. How long does it take for the ball to reach the ground?
x intercept (root)
8 seconds

d. Over what interval is the ball increasing?
values of x → interval (do not include starting or stopping points)
inequality notation $0 < x < 4$
interval notation $(0, 4)$