Notes: Real World Quadratic Applications

1. Brian is in a car at the top of a roller-coaster ride. The distance, d, of the car from the ground as the car descends is determined by the equation $d = 144 - 16t^2$, where t is the number of seconds it takes the car to travel down to each point on the ride. How many seconds will it take Brian to reach the ground? → zero

3 seconds to reach the ground

algebraically

$d = 144 - 16t^2$

perfect squares

$0 = 144 - 16t$

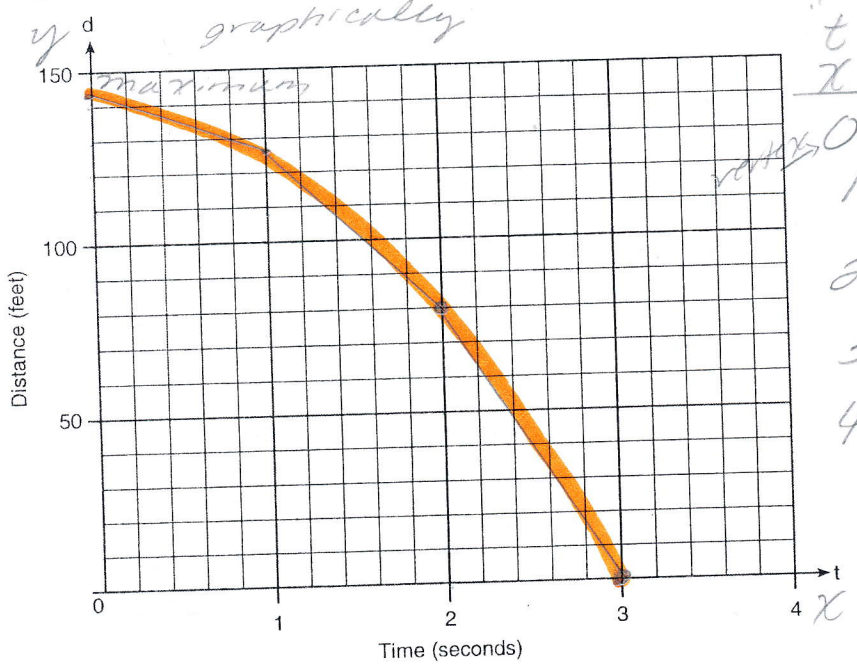
difference → DOTS

$0 = (12 - 4t)(12 + 4t)$

$12 - 4t = 0$
$-12 \quad -12$
$\frac{-4t}{-4} = \frac{-12}{-4}$
$t = 3$

$12 + 4t = 0$
$-12 \quad -12$
$\frac{4t}{4} = \frac{-12}{4}$
$t \neq -3$ reject ble you can not have a neg. time

graphically



"t" x	"d" y
0	144
1	128
2	80
3	0
4	-112

Name: Key
Alg. 1 H – Period: _____
Date: March 3/Glue on page _____

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).

$c = 0$

zeros

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

8 seconds

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

1 & 7 seconds

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

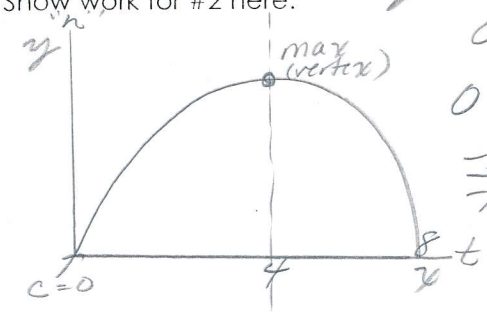
4 sec

d. What is the maximum height?

256 ft

Show work for #2 here.

graphically



"t" x	"h" y
0	0
$\boxed{1}$	$\boxed{112}$
2	192
3	240
$\boxed{4}$	$\boxed{256}$
5	240
6	192
$\boxed{7}$	$\boxed{112}$
8	0

vertex

algebraically

$0 = -16t^2+128t$

$0 = -16t \quad | \quad (t-8)$

$\frac{-16t}{-16} = \frac{0}{-16}$ | $t - 8 = 0$, $+8 \; +8$

$t = 0$ | $t = 8$

axis of sym. (h, k)

$x = \frac{-b}{2a}$

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

$h(t) = -16t^2+128t$

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

$= 256$

3. The entrance to an athletic field is in the shape of a parabolic archway. The archway is modeled by the equation $d = 12x - x^2$, where d represents the distance, in feet, that the arch is above the ground for any x value.

a) for what values of x will the arch be 20 feet above ground?

2 & 10 ft

$20 = 12x - x^2$

$x^2 - 12x + 20 = 0$

$(x-10)(x-2) = 0$

$x = 10 \quad | \quad x = 2$

b) how many feet wide is the base of the arch? 12 feet

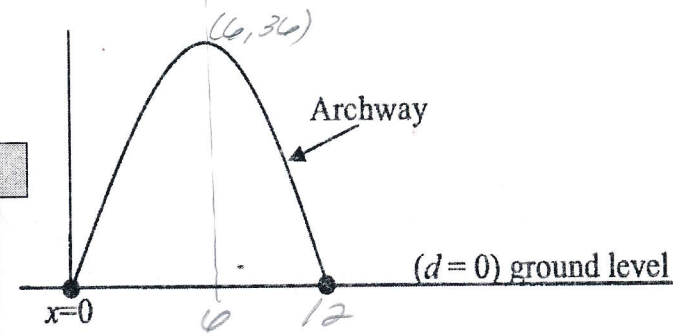
c.) What is the maximum height of the arch above the ground?

36 ft

$x = \frac{-b}{2a} = \frac{-12}{2(-1)} = 6$

$d(6) = 12(6) - (6)^2$

$= 36$



x	y
0	0
2	20
5	35
$\boxed{6}$	$\boxed{36}$
7	35
10	20
12	0

4. A flare is launched from a boat. The height, h, in meters, of the flare above the water is approximately modeled by the function $h(t) = -15t^2 + 150t$, where t is the number of seconds after the flare is launched. How many seconds will it take for the flare to return to the water?

4.) $h(t) = -15t^2 + 150t$

$-15t$ gcf

alg.

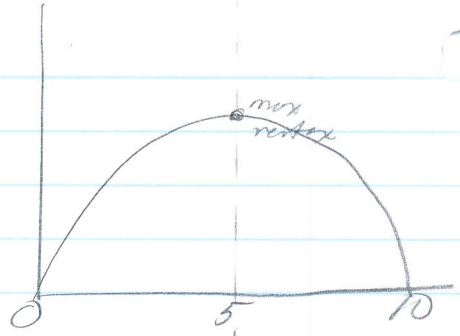
$0 = -15t(t-10)$

$\frac{-15t}{-15} = \frac{0}{-15}$ | $t - 10 = 0$

$t = 0$ | $+10 \quad +10$

$t = +10$

10 seconds



t (x)	h(t) (y)	
0	0	zeros
2	240	
5	375	rel max
8	240	
10	0	zeros