

NON-CALCULATOR

Projectile Motion:

1. Dave went golfing with his friends. He hit his golf ball and it followed the function:

$h(t) = -2t^2 + 16t$ where $h(t)$ is the height of the golf ball over (t) time in seconds.

a. How long will it take for Dave's golf ball to hit the ground?
 $0 = -2t^2 + 16t$ (x-intercept)

$0 = -2t(t-8)$

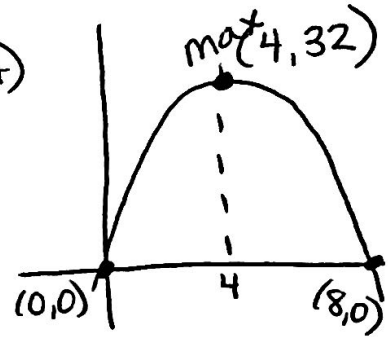
$\frac{0}{-2} = \frac{-2t}{-2}$
 $0 = t$

$t-8=0$
 $t=8$

8 seconds

b. WHEN is the ball at its maximum height?

4 seconds (Midpoint)



c. WHAT is the ball's maximum height? (y-coordinate of vertex)

$h(4) = -2(4)^2 + 16(4)$
 $-2(16) + 64$
 $-32 + 64 = 32$ feet

2. Jenny is practicing her diving off of a spring board. She follows the function:

$h(t) = -t^2 + 6t + 7$ where $h(t)$ is her height from the pool over (t) time in seconds.

a. How long will it take for Jenny to hit the water?

$0 = -1(t^2 - 6t - 7)$ $0 = t - 7$ $0 = t + 1$
 $0 = -1(t-7)(t+1)$ $7 = t$ $-1 = t$

7 seconds

b. WHEN will Jenny reach her maximum height?

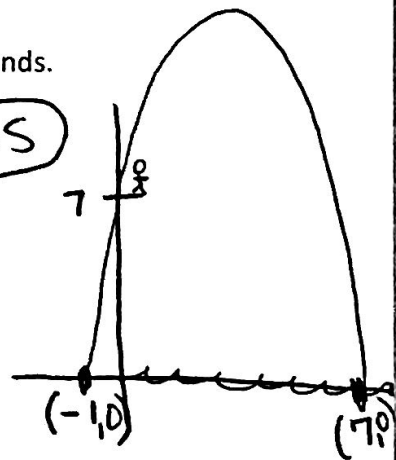
Midpoint: 3 seconds $\frac{-1+7}{2}$

c. WHAT is her maximum height?

$h(3) = -(3)^2 + 6(3) + 7$
 $-9 + 18 + 7 = 16$ feet

d. How high is Jenny at the start (how high is the diving board?)

y-intercept $ax^2 + bx + c$ $-t^2 + 6t + 7$ 7 feet high



e. How high will Jenny be after 5 seconds?

$h(5) = -(5)^2 + 6(5) + 7 = 12$ feet above the pool.

f. What is $h(8)$ and what does it represent in context of this problem?

$h(8) = -(8)^2 + 6(8) + 7 = -9$ ← Jenny will be 9 feet below the water's surface at 8 seconds.

3. A stunt double has to spring-board out of a burning building in a movie. The window is 60 feet above the ground, and the stunt double follows the path: $h(t) = -4t^2 + 8t + 60$

a. WHEN will the stunt double reach his maximum height?

Midpoint

1 second

$$0 = -4(t^2 - 2t - 15)$$

$$-4(t - 5)(t + 3)$$

$$t = 5 \quad t = -3$$

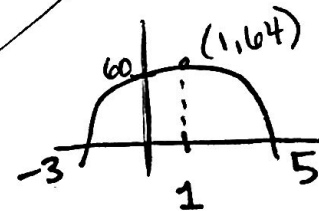
b. WHAT will his maximum height be?

$$-4(1)^2 + 8(1) + 60$$

$$-4 + 8 + 60 = 64 \text{ feet}$$

c. When will the student double hit the ground?

5 seconds



4. A bottle rocket is shot up into the air from a platform. It flies through the air given the function: $h(t) = -5t^2 + 15t + 50$

a. When will the bottle rocket hit the ground?

5 seconds

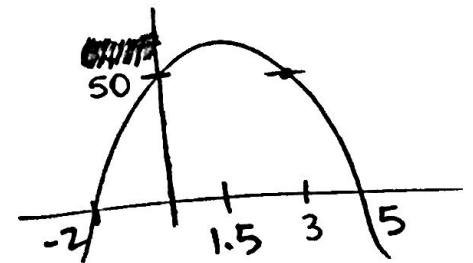
$$0 = -5(t^2 - 3t - 10)$$

$$0 = -5(t - 5)(t + 2)$$

$$t = 5 \quad t = -2$$

b. WHEN will the bottle rocket reach its maximum height?

1.5 seconds



c. Where will the bottle rocket be after 3 seconds?

$$-5(3)^2 + 15(3) + 50$$

$$-45 + 45 + 50$$

50 feet above the ground