Bell Ringer

Tuesday 10/23

Convert each function to vertex form and identify the vertex.

1. $f(x) = x^2 + 4x + 1$　$y = (x+2)^2 - 3$

$$\frac{-4}{2(1)} = -\frac{4}{2} = -2$$

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

$4 - 8 + 1$

Vertex: $(-2, -3)$

2. $f(x) = x^2 - 8x + 5$　$a = 1, b = -8, c = 5$

$$\frac{-b}{2a} \quad \frac{8}{2(1)}$$

$4^2 - 8(4) + 5$

$y = (x-4)^2 - 11$

Vertex: $(4, -11)$
　　　　　h　　k

3. $f(x) = x^2 - 8x - 2$

SKIP

Vertex:

4. $f(x) = 2x^2 + 4x - 1$

$$\frac{-4}{2(2)} = \frac{-4}{4} = -1$$

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

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

Vertex: $(-1, -3)$

I can use properties of quadratic functions to identify and interpret roots, intercepts and the vertex of a quadratic function in the real world.
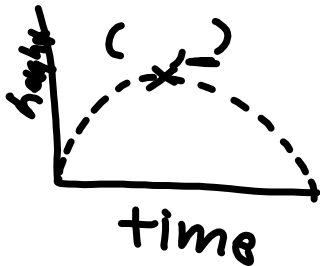
Jennifer hit a golf ball and it followed the projectile
$h(t) = -16t^2 + 100t$ where **t** is the time in seconds,
and **h** is the height of the ball. What was the
maximum height the ball reached?

$ax^2 + bx + c$

$(t, h(t))$

$(time, height)$

156.25 ft

height

(x, y)

time

$\dfrac{-b}{2a}$
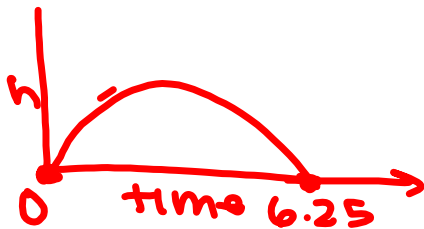
$\dfrac{-100}{(2(-16))} =$

$(3.125, 156.25)$

$= -16(3.125)^2 + 100(3.125)$

Jennifer hit a golf ball and it followed the projectile h(t) = $-16t^2$ + 100t + 0 where **t** is the time and in seconds, and **h** is the height of the ball. What was the starting height of the ball?

$$-16(0)^2 + 100(0) = 0 \text{ feet}$$

Jennifer hit a golf ball from the ground and it followed the projectile $h(t) = -16t^2 + 100t$ where **t** is the time and in seconds, and **h** is the height of the ball. For how long was the ball in the air?

$$-16t^2 + 100t = 0$$

$$4t(-4t + 25) = 0$$

time 6.25

(time, height)

$$4t = 0 \qquad -4t + 25 = 0$$
$$\frac{4t}{4} = \frac{0}{4} \qquad -25 \quad -25$$

6.25 seconds!
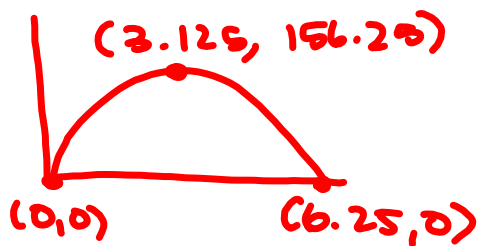
$$t = 0 \qquad \frac{-4t}{-4} = \frac{-25}{-4}$$

$$t = 6.25$$

Jennifer hit a golf ball from the ground and it followed the projectile $h(t) = -16t^2 + 100t$ where **t** is the time and in seconds, and **h** is the height of the ball. Give a reasonable domain and range for the scenario.

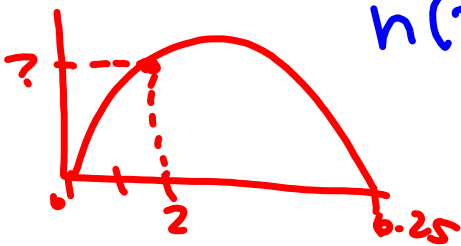(3.125, 156.25)

(0,0)   (6.25, 0)

D: [0, 6.25]

R: [0, 156.25]

Jennifer hit a golf ball from the ground and it followed the projectile $h(t) = -16t^2 + 100t$ where **t** is the time and in seconds, and **h** is the height of the ball. What was the height of the ball after 2 seonds?
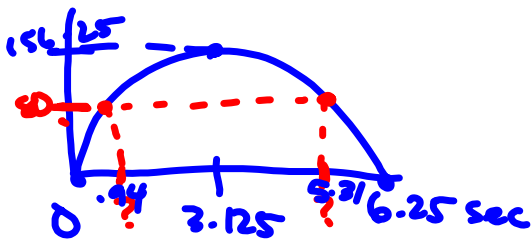
$$h(2) = -16(2)^2 + 100(2)$$

$$h(2) = 136$$

at 2 seconds, the ball was 136 ft high

Jennifer hit a golf ball from the ground and it followed the projectile $h(t)$ = -16t^2 + 100t where **t** is the time and in seconds, and **h** is the height of the ball. How long after she hit the ball was it 80 feet off the ground?

$$-16t^2 + 100t = 80$$
$$ -80 \quad -80$$
$$-16t^2 + 100t - 80 = 0$$
$$\underset{a}{} \quad \underset{b}{} \quad \underset{c}{}$$

$$\frac{-100 \pm \sqrt{100^2 - 4(-16)(-80)}}{2(-16)}$$

156/25

80

0   .94   3.125   5.31 6.25 sec
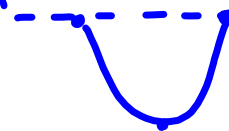
Given Standard Form
$$f(x) = ax^2 + bx + c$$
Find the:

Max/min **Vertex**

Starting height **(0, c) Y-int**

Time in air **X-int**

Domain and Range

Height at a specific time **h(4)**

Time at a specific height **= 80**

Name: _____Hr:_____

Applications of Quadratics Day 1

(handwritten: (t,h) — (seconds, height))

1. If an M-16 is fired straight upward, then the height h(t) of the bullet in feet at time t in seconds is given by
   $h(t) = -16t^2 + 325t + 4$.

   a) What is the starting height of the bullet?

   (handwritten: $-16(0)^2 + 325(0) + 4$ = 4 ft)

   b) How long does it take for the bullet to return to the earth?

   (handwritten: $\frac{-325 \pm \sqrt{325^2 - 4(-16)(4)}}{2(-16)}$ = 20.32 seconds)

   c) What is the maximum height?

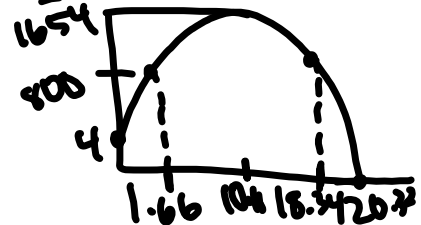   *(handwritten: $\frac{-b}{2a}$ $\frac{-325}{2(-16)}$ (10.16, 1,654.39) 1,654.39 ft)*

   d) What is a realistic domain and range?

   (handwritten: D: [0, 20.32]   R: [0, 1,654.39])

   e) At a height of 500 feet how much time has passed? *(t = ?)*

   (handwritten: $-16t^2 + 325t + 4 = 500$
   $-500 -500$
   $-16t^2 + 325t - 496 = 0$
   1.66 or 18.5420)*

2. A contestant tosses a horseshoe from one pit to another with an initial vertical velocity of 50 feet per second. The horseshoe is released 3 feet above the ground. Use the model $h = -16t^2 + 50t + 3$, where h is the height (in feet) and t is the time (in seconds) to tell how long the horseshoe was in the air.

3. The number of mosquitoes $M(x)$, in millions, in a certain area depends on the June rainfall x, in inches, according to the equation $M(x) = 10x - 2x^2$. What rainfall produces the maximum number of mosquitoes?

   (handwritten: vertex)

4. The polynomial function $I(t) = -0.1t^2 + 1.9t$ represents the yearly income (or loss) from a real estate investment, where t is time in years after 1970. During what year does the maximum income occur?

5. Your company uses the quadratic model $y = -7x^2 + 350x$ to represent how many units y of a new product will be sold x weeks after its release. How many units can you expect to sell in week 27?

6. Your company uses the quadratic model $y = -4.5x^2 + 150x$ to represent the average number of new customers who will be signed on x weeks after the release of your new service. How many new customers can you expect to gain in week 8?

7. The profit for a company is given by $P(x) = -0.0002x^2 + 140x - 250000$, where x is the number of units produced. What production level will yield a maximum profit?

8. A boy tosses a ball upward at 32 feet per second from a window that is 48 feet above the ground. The height of the ball above ground (in feet) at time t (in seconds) is given by $h(t) = -16t^2 + 32t + 48$.
  a) Find the time at which the ball strikes the ground.

  b) At a height of 60 feet how much time as passed?

9. A rock is thrown upward so that its distance, in feet, above the ground after t seconds is $h(t) = -14t^2 + 336t$.
  a. Find the zeros of the function and explain the meaning in the context of the problem.

  b. Find the vertex of the function and explain the meaning in the context of the problem.

  c. What is a realistic Domain and Range?