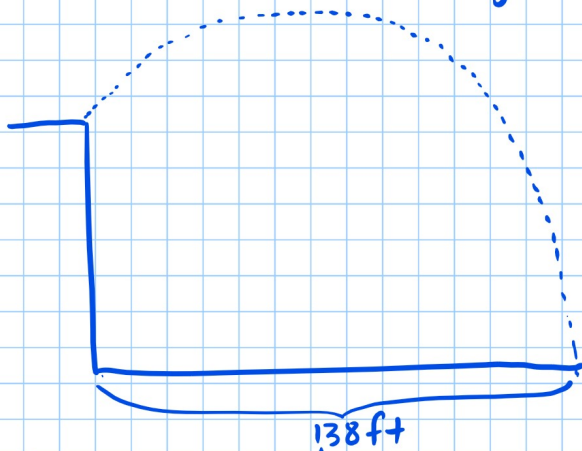


ex: A projectile is shot upward from a cliff. Its height is modeled by $h(t) = -16t^2 + 80t + 96$ where t is time in seconds. Its initial horizontal velocity was 23 ft/sec .

- After how many seconds does the projectile hit the ground?
- How far from the base of the cliff does the projectile land?
- What is the highest height it reached?



b)

$$X = V_{0x} t$$

$$X = 23t$$

In 6 seconds

$$X = 23 \cdot 6$$

$$X = 138 \text{ ft}$$

a) Set $h = 0$

$$0 = -16t^2 + 80t + 96$$

$$\frac{0}{-16} = \frac{-16(t^2 - 5t - 6)}{-16}$$

$$0 = t^2 - 5t - 6$$

$$0 = (t-6)(t+1)$$

$$t-6=0 \quad t+1=0$$

$$t=6 \quad \cancel{t=-1}$$

6 seconds

$$\begin{array}{r} -6 \\ -6 \quad 1 \\ -5 \end{array}$$

c) $h(t) = -16t^2 + 80t + 96$

highest height at vertex

$$x = -\frac{b}{2a} = \frac{-80}{2(-16)} = \frac{-80}{-32} = 2.5 \text{ sec}$$

$$h(2.5) = -16(2.5)^2 + 80(2.5) + 96$$

$$= 196 \text{ ft}$$

2) A snowball is launched from a slingshot with an initial vertical velocity of 14 m/sec and an initial ^{horizontal} velocity of 30 m/sec . If it is launched from 1.2 m high, how far away will the snowball travel?

$$y = \frac{1}{2}gt^2 + v_{oy}t + y_0$$

$$g = -9.8$$

$$v_{oy} = 14$$

$$y_0 = 1.2$$

$$y = -4.9t^2 + 14t + 1.2$$

2.94 sec to hit ground

$$x = v_{ox}t$$

$$v_{ox} = 30$$

$$x = 30t$$

$$x = 30 \cdot 2.94$$

$$x = 88.2 \text{ m}$$

height ↓