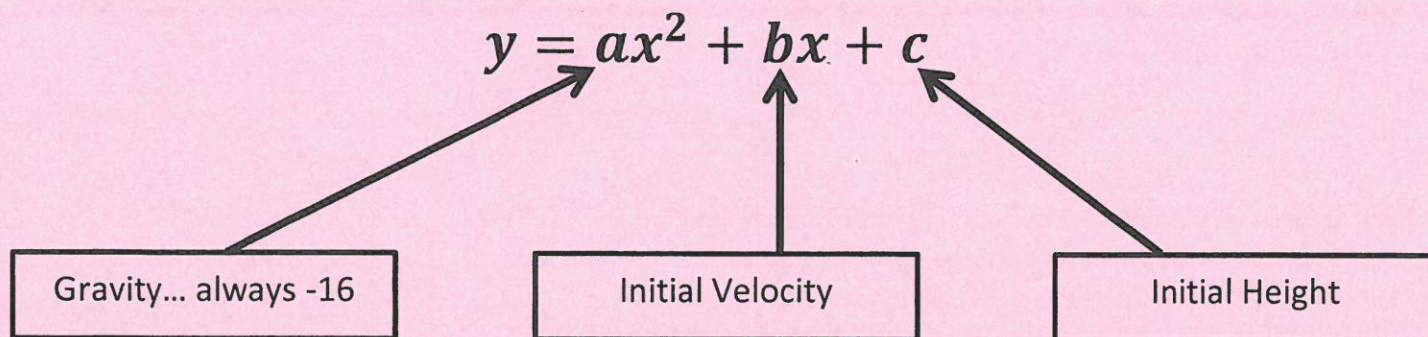


Using Quadratic Equations to Model Projectile Motion



Example 1: A cannon is launched directly upward at 64 feet per second from a platform 80 feet high.

- When will the cannon reach its maximum height?
- What will be the maximum height?
- When will the cannon reach the ground?

$$y = -16x^2 + 64x + 80$$

$$y = -16(x^2 - 4x - 5)$$

$$y = -16(x-5)(x+1)$$

$$a) \quad x = \frac{-64}{2(-16)} = 2 \quad y = -16(2)^2 + 64(2) + 80 = 144$$

after 2 seconds

$$b) \quad 144 \text{ feet}$$

$$c) \quad 0 = -16(x-5)(x+1) \quad x=5, x=-1$$

after 5 seconds

Example 2: Mr. Belby recently found out he cannot eat anything with fructose in it. Sadly, Mr. Sacco had just baked him a delicious chocolate cake. Mad and hungry, Mr. Belby stomped up to the top of the nearest 75ft cliff and tossed that cake over the edge with a velocity of 64 feet per second.

- a. At what time will the cake reach its maximum height? $x = 2 \text{ sec}$
- b. What is the maximum height the cake will reach? $y = 139 \text{ ft}$
- c. What is the height of the cake after 3 seconds? $h(3) = 123 \text{ ft}$
- d. How long will it take for the cake to reach the ground? 4.95 sec

$$y = -16x^2 + 64x + 75$$

$$\begin{array}{r} -1200 \\ ? \times ? \\ \hline 64 \end{array}$$

Completing the square will be nasty.

lets learn something new... the Quadratic Formula!

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-64 \pm \sqrt{(64)^2 - 4(-16)(75)}}{2(-16)}$$

$$x = -0.95 \quad \& \quad x = 4.95$$

Hdy Cow! Where did that rule come from!

Lets Find Out!