The Quadratic Formula is particularly nice when the solutions are **irrational numbers** and thus cannot be found by factoring. Sometimes, we have to place the answers to these equations in **simplest radical form** and sometimes we just need decimal approximations.

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

THIS WAS HW

***Exercise* #4:** For each of the following quadratic equations, find the solutions using the Quadratic Formula and express your answers in **simplest radical form**.

(a) $x^2 + 6x - 9 = 0$

$a = 1$
$b = 6$
$c = -9$

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

$$\frac{-6 \pm \sqrt{(6)^2 - 4(1)(-9)}}{2}$$

$$\frac{-6 \pm \sqrt{72}}{2}$$

$$\frac{-6 \pm \sqrt{72}}{2}$$

$$\frac{-6 \pm \sqrt{36}\sqrt{2}}{2}$$

$$\frac{-6 \pm 6\sqrt{2}}{2}$$

$$\boxed{-3 \pm 3\sqrt{2}}$$

$-3 + 3\sqrt{2}$ $\quad -3 - 3\sqrt{2}$

(b) $3x^2 + 4x - 1 = 0$

$a = 3$
$b = 4$
$c = -1$

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

$$\frac{-4 \pm \sqrt{(4)^2 - 4(3)(-1)}}{6}$$

$$\frac{-4 \pm \sqrt{28}}{6}$$

$$\frac{-4 \pm \sqrt{28}}{6}$$

$$\frac{-4 \pm \sqrt{4}\sqrt{7}}{6}$$

$$\frac{-4 \pm 2\sqrt{7}}{6}$$

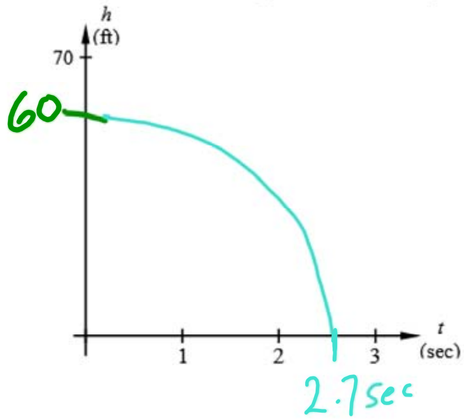
$$\boxed{\frac{-2 \pm \sqrt{7}}{3}}$$

Many times in applied problems it makes much greater sense to express the answers, even if irrational, as approximated decimals.

***Exercise* #5:** A projectile is fired vertically from the top of a 60 foot tall building. It's height in feet above the ground after t-seconds is given by the formula

$$h = -16t^2 + 20t + 60$$

Using your calculator, sketch a graph of the projectile's height, h, using the indicated window. At what time, t, does the ball hit the ground? Solve by using the quadratic formula to the nearest *tenth* of a second.



$a = -16$
$b = 20$
$c = 60$

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

$$\frac{-20 \pm \sqrt{(20)^2 - 4(-16)(60)}}{-32}$$

$$\frac{-20 \pm \sqrt{4240}}{-32}$$

$$\frac{-20 + \sqrt{4240}}{-32} \qquad \boxed{\cancel{-1.4}} \quad \text{neg. time}$$

$$\frac{-20 - \sqrt{4240}}{-32} \qquad \boxed{2.7} \checkmark$$