A skydiver jumps from a plane that is at an altitude f 1700 ft.
The function $y = -16t^2 + 1700$ gives the jumper's height y, in feet, after t seconds.

a. How long is the jumper in free fall if the parachute opens at 1000 ft?

$$1000 = -16t^2 + 1700$$
$$-1700 \qquad\qquad -1700$$
$$\frac{-700}{-16} = \frac{-16t^2}{-16}$$
$$\sqrt{t^2} = \sqrt{\frac{700}{16}}$$

$t = \pm 6.61$ Only the pos answer makes sense.

$\boxed{t = 6.61 \text{ sec}}$

b. How long would it take to reach the ground if the parachute didn't open?

$$0 = -16t^2 + 1700$$
$$-1700 \qquad\qquad -1700$$
$$\frac{-1700}{-16} = \frac{-16t^2}{-16}$$
$$\sqrt{t^2} = \sqrt{\frac{1700}{16}}$$

$t = \pm 10.31$ Only the pos answer makes sense.

$\boxed{t = 10.31 \text{ sec}}$

A ball is thrown into the air from an initial height of 5 feet with an initial velocity of 38 ft/sec. The following equation models the height of the ball as a function of time: $h(t) = -16t^2 + 38t + 5$

Find the time it takes the ball to come back down to the ground.

$$0 = -16t^2 + 38t + 5$$

rewrite so a is pos.
Move all terms to the left side of the eq.

$$16t^2 - 38t - 5 = 0$$

-80, -40, 2, -38

	$2t$	-5
$8t$	$16t^2$	$-40t$
$+1$	$2t$	-5

$$(8t+1)(2t-5)$$

$$t = \frac{-1}{8} \qquad \frac{5}{2}$$

Only the pos answer makes sense in this situation.

Solving Quadratic Equations:

Factoring and using Square roots are good methods, BUT they only work some of the time

- Factoring — Not everything is factorable
- Square Roots — Only possible if $b=0$ or eq. is in Vertex Form.

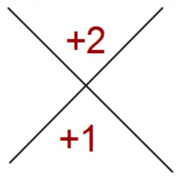
Given this equation: $x^2 + x + 2 = 0$

Can you solve this equation by taking square roots?

No, Square roots can't be used if there is a linear term

Given this equation: $x^2 + x + 2 = 0$

Can you solve this equation by factoring?



No, this doesn't factor. There are no integers that multiply to 2 and add to 1

Factoring works SOME of the time.

Using Square Roots works SOME of the time.

Is there anything that works ALL of the time?

Quadratic Formula

Sec 5-8: The Quadratic Formula

Equation must be written in the following form:

$ax^2 + bx + c = 0$

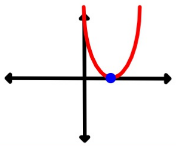
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The results of using the Quadratic Fomula represent:

- solutions to the equation
- zeros of the function
- x-intercepts of the graph
- roots of the function

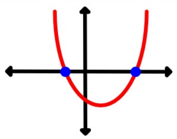
# of solutions to a Quadratic Equation. (same as # x-intercepts on the graph)

1 Real Solution



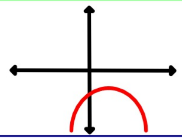
Only the vertex touches the x-axis

2 Real Solutions



The parabola crosses the x-axis in two places

No Real Solution



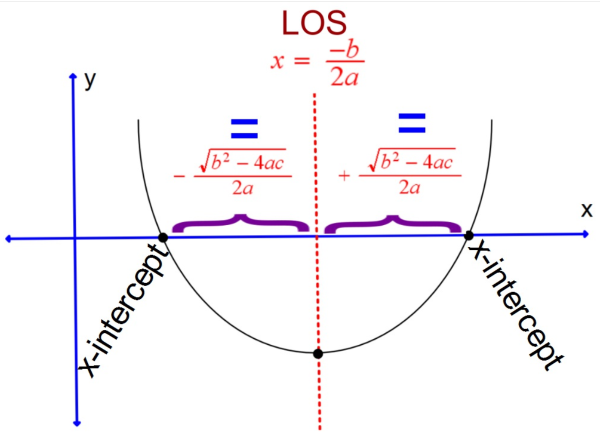
The parabola doesn't touch the x-axis

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Can be written as:

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

LOS

?



$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ Can be written as:

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

LOS

Distance from LOS to both x-intercepts.

Find all real solutions to the nearest hundredth.

$$6x^2 + 7x - 20 = 0$$

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

1st: Find $b^2 - 4ac = 529$

2nd: Rewrite the Quadratic Formula Using this value in place of $b^2 - 4ac$ and replace 2a & -b with their values

$$\frac{-7 \pm \sqrt{529}}{12}$$

3rd: Calculate the two answers

$\boxed{x = -2.5, 1.33}$

Find all EXACT Real Solutions.

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

$$x^2 + 3 = 5x$$

rewrite in Standard Form: $x^2 - 5x + 3 = 0$

$b^2 - 4ac = 13$

$$\boxed{x = \frac{5 \pm \sqrt{13}}{2}}$$

Since the directions ask for EXACT solutions and $\sqrt{13}$ can't be simplified this is the final answer.

Find all EXACT Real Solutions.

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

$$x^2 - 8x - 2 = 0$$

$b^2 - 4ac = 72$

$$x = \frac{8 \pm \sqrt{72}}{2} = \frac{8 \pm 6\sqrt{2}}{2} = \boxed{4 \pm 3\sqrt{2}}$$