Rewrite this equation into Vertex Form: $y = x^2 - 12x - 31$

You could do this by Completing the Square

$y = x^2 - 12x - 31$

$+31 \quad +31$

$y + 31 + 36 = x^2 - 12x + 36$

$(x-6)^2$

$y + 67 = (x-6)^2$

$-67 \quad -67$

$y = (x-6)^2 - 67$

OR

You could find the coordinates of the Vertex and use that to write it in Vertex Form.

$y = x^2 - 12x - 31$

LOS: $x = \frac{-b}{2a} = \frac{12}{2}$

$x = 6$

Vertex: $(6, -67)$

$y = (6)^2 - 12(6) - 31$

$y = -67$

$y = (x-6)^2 - 67$

Solve by Completing the Square.

$2x^2 + 5x - 8 = 0$

$+8 \quad +8$

$\frac{2x^2 + 5x}{2} = \frac{8}{2}$

$x^2 + \frac{5}{2}x + \frac{25}{16} = 4 + \frac{25}{16} = \frac{64}{16} + \frac{25}{16} = \frac{89}{16}$

$\left(x + \frac{5}{4}\right)^2$

$\sqrt{\left(x + \frac{5}{4}\right)^2} = \sqrt{\frac{89}{16}}$

$x + \frac{5}{4} = \frac{\pm\sqrt{89}}{4}$

$-5/4 \quad -5/4$

$\Rightarrow \frac{-5 \pm \sqrt{89}}{4}$

This problem shows you why it is easiest to use this method when a=1 and b is even!

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

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

h

$1000 = -16t^2 + 1700$

$-1700 \quad -1700$

$-700 = -16t^2$

$\frac{-700}{-16} = \frac{-16t^2}{-16}$

$\sqrt{t^2} = \sqrt{43.75}$

$t = 6.6$ sec

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

h = 0

$0 = -16t^2 + 1700$

$-1700 \quad -1700$

$-1700 = -16t^2$

$\frac{-1700}{-16} = \frac{-16t^2}{-16}$

$\sqrt{t^2} = \sqrt{106.25}$

$t = 10.31$ sec

A ball is thrown into the air from an initial height of 25 feet with an initial velocity of 88 ft/sec. The following equation models the height (h - ft) of the ball as a function of time(t - sec): $h(t) = -16t^2 + 88t + 25$

a) Find the balls maximum height.

Vertex, y-coord

146 ft

b) Find the time it takes the ball to reach its maximum height.

x-coord, Vertex

2.75 sec

LOS: $t = \frac{-88}{-32} = 2.75$

(t, h)

$h(2.75) = 146$

A ball is thrown into the air from an initial height of 25 feet with an initial velocity of 88 ft/sec. The following equation models the height (h - ft) of the ball as a function of time(t - sec): $h(t) = -16t^2 + 88t + 25$

How would you find the time it takes the ball to come back down to the ground?

make $h = 0$

$0 = -16t^2 + 88t + 25$

Solving Quadratic Equations:

Factoring,using Square Roots, and Completing the Square 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.
- Completing the Square → a must be 1 and it's easiest if b is even.

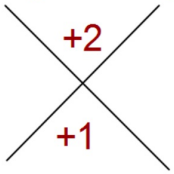
Given this equation: $x^2 + x + 2 = 0$

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

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

Can you solve this by Completing the square?

Yes, but since b is odd it wouldn't be as easy.

- Solving by factoring works only SOME of the time
- Solving using Square Roots works only SOME of the time
- Solving by Completing the Square can work all the time but may not be "easy".
- Solving by graphing works all the time if you have the technology, but, doesn't always give EXACT solutions.
- Using the Quadratic Formula ALWAYS works.

Section 5-8: The Quadratic Formula.

Sec 5-8: To solve using Quadratic Formula

Equation must be written in the following form:

$$ax^2 + bx + c = 0$$

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

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 -b and 2a with their values.

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

3rd: Calculate the two answers

$X = -2.5, 1.33$