Solving an equation graphically!

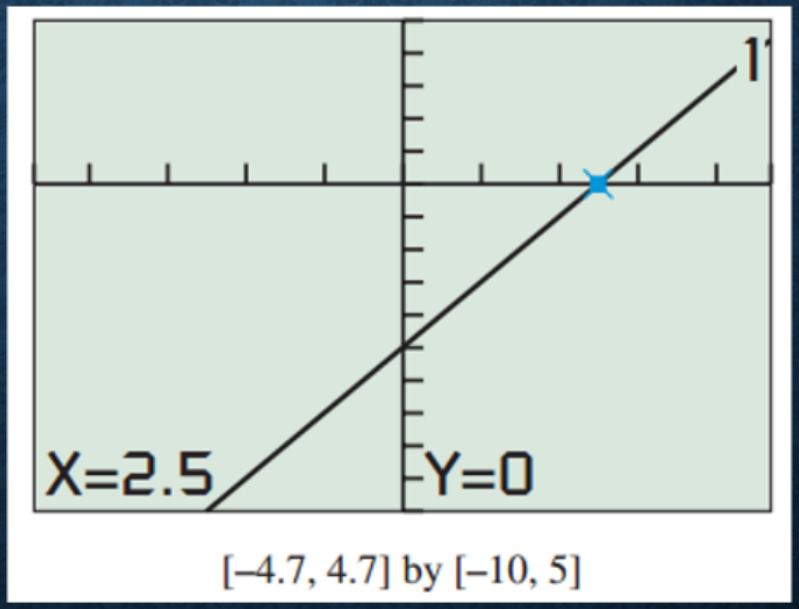
$$2x - 5 = 0$$

$$\frac{2x}{2} = \frac{5}{2}$$

$$x = \frac{5}{2}$$

$$2.5$$

Zero



[–4.7, 4.7] by [–10, 5]

Solving by Finding *x*-Intercepts

Solve the equation $2x^2 - 3x - 2 = 0$ graphically.

$y = 2x^2 - 3x - 2$

Substitute *y* for 0 and graph the function!

Algebraically.....

$2x^2$ -2

$(2x + 1)(x - 2) = 0$

$-4x$ $+1x$

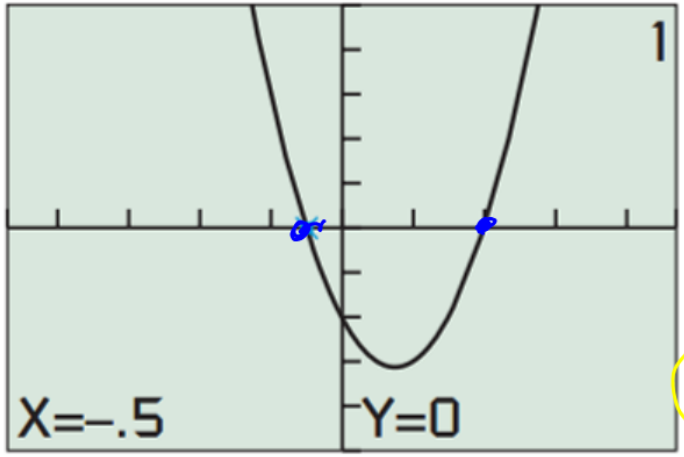
$x = 2$

$2x + 1 = 0$

$2x = -1$

$x = -\frac{1}{2}$

$-\frac{1}{2}, 2$



[–4.7, 4.7] by [–5, 5]

-4 1 -3 -4

$3x^2 + 14x - 5 = 0$

Zero Factor Property

Let a and b be real numbers.

If $ab = 0$, then $a = 0$ or $b = 0$.

$3x - 1 = 0$
$3x = 1$
$x = \frac{1}{3}$

$x + 5 = 0$
$x = -5$

$(3x - 1)(x + 5) = 0$

DEFINITION Quadratic Equation in x

A **quadratic equation in x** is one that can be written in the form

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

where a, b, and c are real numbers with $a \neq 0$.

SQUARE ROOT PRINCIPLE

If $t^2 = K > 0$, then $t = \sqrt{K}$ or $t = -\sqrt{K}$.

$\sqrt{t^2} = \sqrt{36}$

$t = \pm\sqrt{36}$

$t = \pm 6$

Solving by Extracting Square Roots

Solve $(2x - 1)^2 = 9$ algebraically.

$\sqrt{(2x-1)^2} = \pm\sqrt{9}$

$2x - 1 = \pm 3$

$2x - 1 = 3$

$2x = 4$

$x = 2$

and

$2x - 1 = -3$

$2x = -2$

$x = -1$

Completing the Square

To solve $x^2 + bx = c$ by **completing the square**, add $(b/2)^2$ to both sides of the equation and factor the left side of the new equation.

$$x^2 + bx + \left(\frac{b}{2}\right)^2 = c + \left(\frac{b}{2}\right)^2$$

$$\left(x + \frac{b}{2}\right)^2 = c + \frac{b^2}{4}$$

$x^2 + 8x + 16 = 3 + 16$

$(x+4)^2 = 19$

$x+4 = \pm\sqrt{19}$

$x = -4 \pm \sqrt{19}$

Solving by Completing the Square

Solve $4x^2 - 20x + 17 = 0$ by completing the square.

$$\frac{4x^2}{4} - \frac{20x}{4} = \frac{-17}{4}$$

$$x^2 - 5x + \frac{25}{4} = \frac{-17}{4} + \frac{25}{4}$$

$$\left(\frac{5}{2}\right)^2 = \frac{25}{4}$$

$$(x - \tfrac{5}{2})^2 = 2$$

$$x - \frac{5}{2} = \pm\sqrt{2}$$

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

$x \approx 3.94$
$x \approx 1.08$