Nov. 6, 2017

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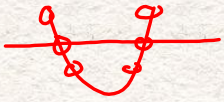
Roots of Quadratic Equations

Roots of quadratic equations have 3 names:

1. Roots
2. Zeros
3. X-Intercepts



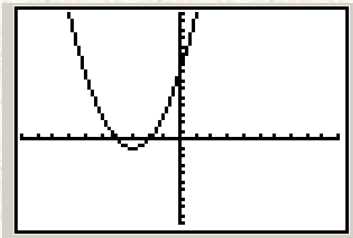
We are looking for the 2 values of 'x' that make the quadratic true when y = 0

We can find the roots threeways:

$y = a(x-r)(x-s)$

1. Use the graphing calculator (graph and find the points where the graph crosses the x-axis)
2. Factor the equation
3. Quadratic formula

Method 1: Graphing



$y = x^2 + 6x + 8$

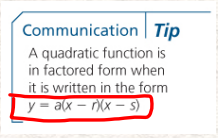
$(x+2)(x+4)$

x-intercepts? x = -2 and x = -4

-2 & -4 are the roots (or zeros) of $y = x^2 + 6x + 8$

Method 2: Factoring

$y = x^2 + 6x + 8$



What 2 #'s multiply to give 8 and add to give 6?

Once you have the 2 factors, set the y to zero and solve both factors for 'x'.

Example: Find the zeros of $y = x^2 + 2x - 15$

Find the zeros of the following functions:

1) $y = x^2 + 5x + 6$ 2) $y = x^2 - 5x - 14$

3) $y = x^2 + 4x + 4$ 4) $y = x^2 - 16x - 36$

5) $y = x^2 - 7x + 12$ 6) $y = x^2 + 6x + 14$

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Method 3: The Quadratic Formula

Must be in standard form

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

**Note the 2a is under everything on the top!

This formula can be used to find the roots for any quadratic equation in the form of $ax^2 + bx + c = 0$. Note, the equation MUST equal zero for the formula to work!

Solve $x^2 + 3x - 4 = 0$

$y = x^2 + 3x - 4$

$(x+4)(x-1)$

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

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

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

$$x = \frac{-3 \pm \sqrt{9 + (+16)}}{2}$$

$$x = \frac{-3 \pm \sqrt{25}}{2}$$

$$x = \frac{-3 \pm 5}{2}$$

$$x = \frac{-3 + 5}{2} = 1$$

$$x = \frac{-3 - 5}{2} = \frac{-8}{2} = -4$$

Solve $2x^2 - 4x - 3 = 0$

$a = 2$, $b = -4$, $c = -3$

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

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(2)(-3)}}{2(2)}$$

$$x = \frac{4 \pm \sqrt{16 - (-24)}}{4}$$

$$x = \frac{4 \pm \sqrt{40}}{4}$$

$$x = \frac{4 \pm 6.3}{4}$$

$$x = \frac{4 + 6.3}{4}$$

$$x = 2.6$$

$$x = \frac{4 - 6.3}{4}$$

$$x = -0.58$$