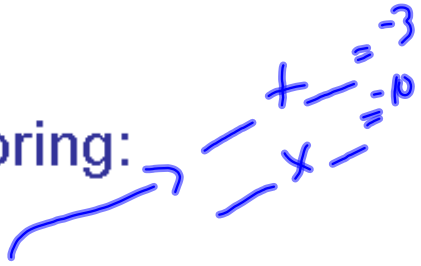
Another Example...

Solving Equations by Factoring:

Solve: $x^2 - 10 = 3x$



1. Get one side = 0 $x^2 - 3x - 10 = 0$
2. Factor completely $(x - 5)(x + 2) = 0$
3. Set each factor = 0 $x - 5 = 0$ *OR* $x + 2 = 0$
4. Solve each equation $x = 5$ *OR* $x = -2$
5. Check in original $(5)^2 - 10 = 3(5)?$ $(-2)^2 - 10 = 3(-2)?$
   $25 - 10 = 15$ *YES* $4 - 10 = -6$ *YES*
6. Solution set $\{5, -2\}$

EXAMPLE #2: Determine the zeroes of the following...

$y = 5x^2 - 17x + 6$

x-Intercepts (let $y = 0$)

let $y = 0$

$0 = 5x^2 - 17x + 6$

$0 = 5x^2 - 2x - 15x + 6$

$0 = x(5x - 2) - 3(5x - 2)$

$0 = (5x - 2)(x - 3)$

$5x - 2 = 0$ or $x - 3 = 0$

$\frac{5x}{5} = \frac{2}{5}$ $\quad x = 3$

$x = 2/5$

Creating a Quadratic Equation given Two Roots (x-int)

EXAMPLE #3:

Create a quadratic equation that has the following roots...

a) -7 & 4

$x=-7$ or $x=4$

$x+7=0$ or $x-4=0$

$(x+7)(x-4)=0$

$x^2-4x+7x-28=0$

$x^2+3x-28=0$

b) -5/2 & 2/3

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

$2x=-5$ $\quad 3x=2$

$2x+5=0$ $\quad 3x-2=0$

$(2x+5)(3x-2)=0$

$6x^2-4x+15x-10=0$

$6x^2+11x-10=0$

$\left(x+\frac{5}{2}\right)\left(x-\frac{2}{3}\right)=0$

$x^2-\frac{2}{3}x+\frac{5}{2}x-\frac{10}{6}=0$

$x^2-\frac{4}{6}x+\frac{15}{6}x-\frac{10}{6}=0$

$6\left(x^2+\frac{11}{6}x-\frac{10}{6}=0\right)$

$6x^2+11x-10=0$

Solving by completing the Square (Finding x-intercepts)

EXAMPLE:

Determine the x-intercepts of the following...

$$y = x^2 + 4x + 1$$

$0 = x^2 + 4x + 1$

WILL NOT FACTOR!!

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

$(x+2)^2 - 3 = 0$

$\sqrt{(x+2)^2} = \sqrt{3}$

$x + 2 = \pm\sqrt{3}$

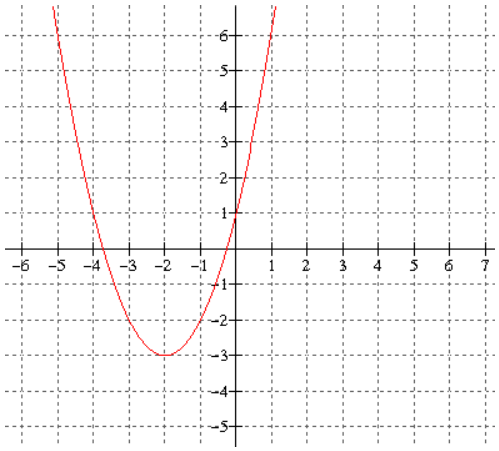
$x = -2 \pm \sqrt{3}$

$x = -2 + \sqrt{3}$ or $x = -2 - \sqrt{3}$

$x \doteq -0.3$ $\quad x \doteq -3.7$

if $x^2 = 25$, then $x = \pm 5$

Note



EXAMPLE #3 - What is happening if the left side is negative?

$y = -2(x - 5)^2 - 4$

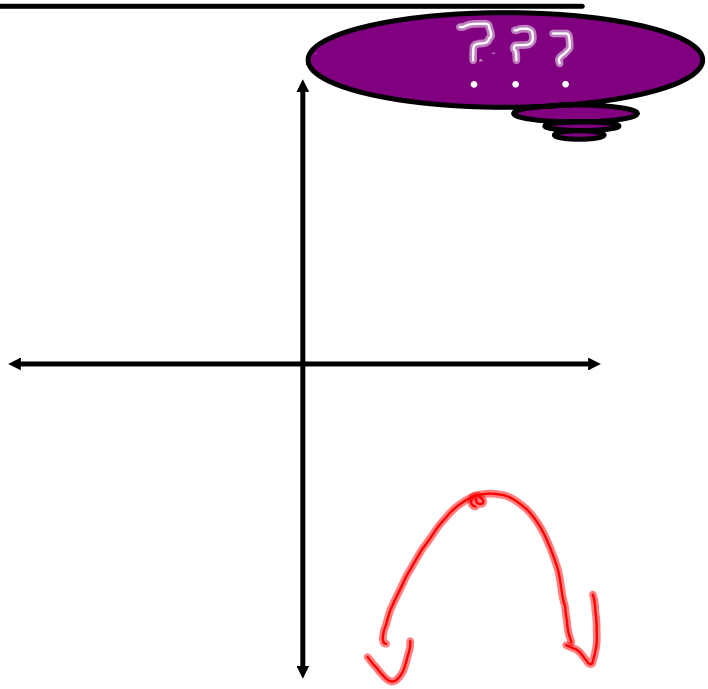
$0 = -2(x-5)^2 - 4$

$\frac{4}{-2} = \frac{-2(x-5)^2}{-2}$

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

Uh oh??

No Solutions



Quadratic Formula Video

The quadratic Formula Song!!!

Taken from....

http://www.calculus-help.com/funstuff/calculussongs.html

Let's Derive the Formula

Proof: **Here is the plan...**

- **start with the General Form of the quadratic.**
- **find the *x*-intercepts by letting *y* equal zero.**
- **put equation into Standard Form using the "complete the square method".**
- **solve by isolating the variable.**

$y = ax^2 + bx + c$

$\frac{1}{2} \times \frac{b}{a} =$

$ax^2 + bx + c = 0$

$a\left(x^2 + \frac{b}{a}x + \frac{b^2}{4a^2}\right) + c - \frac{b^2}{4a} = 0$

$a\left(x + \frac{b}{2a}\right)^2 + \frac{4ac - b^2}{4a} = 0$

$\left(\frac{1}{a}\right)a\left(x + \frac{b}{2a}\right)^2 = -\frac{4ac - b^2}{4a}\left(\frac{1}{a}\right)$

$\sqrt{\left(x + \frac{b}{2a}\right)^2} = \sqrt{\frac{b^2 - 4ac}{4a^2}}$

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

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

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

QUADRATIC FORMULA

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

Quadratic Formula Video!!!

Example #1: Use the quadratic formula to determine the exact roots of the following quadratic...

$$0 = -3x^2 + 10x - 8$$

$$x = \frac{-(+10) \pm \sqrt{(+10)^2 - 4(-3)(-8)}}{2(-3)}$$

a = -3
b = +10
c = -8

$$x = \frac{-10 \pm \sqrt{100 - 96}}{-6}$$

$$x = \frac{-10 \pm \sqrt{4}}{-6}$$

$$x = \frac{-10 \pm 2}{-6}$$

$x = \frac{-10-2}{-6}$ or $x = \frac{-10+2}{-6}$

$x = 2$

$x = \frac{-8}{-6}$

$x = \frac{4}{3}$

Example #2: Use the quadratic formula to determine the exact roots of the following quadratic...

Nearest Tenth

$$0 = 1.2x^2 - 3.8x + 2.3$$

$$x = \frac{-(-3.8) \pm \sqrt{(-3.8)^2 - 4(1.2)(+2.3)}}{2(1.2)}$$

a =
b =
c =

$$x = \frac{3.8 \pm \sqrt{3.4}}{2.4}$$

$$x = \frac{3.8 \pm 1.843}{2.4}$$

$x \doteq 2.4$ or $x \doteq 0.8$

Homework...

page 48:

#24
#28 a
#30 c, e, f
#31 a, c
#32 d, e, f

SOLUTIONS...

#24. a) -6 and 2 b) $-\frac{1}{2}$ and $\frac{1}{3}$ c) 1 and 5

d) $-1\pm\sqrt{3}$ e) $-1\pm\sqrt{3}$ f) $-2\pm 2\sqrt{2}$

#28 a) $\frac{6\pm\sqrt{-16}}{2}$ b) above $x-$axis and opening upwards

c) no $x-$intercepts

#30. c) $4\pm\sqrt{22}$

e) $3\pm\sqrt{12}$

f) $\frac{1\pm\sqrt{5}}{2}$

#31. a) $x\approx -0.986$ or 2.510

c) $\frac{\sqrt{2}}{4}, -\sqrt{2}$

#32. d) $\frac{3}{4}, -2$

e) $\frac{\sqrt{6}\pm\sqrt{14}}{-2}$

f) $\frac{5\sqrt{2}\pm\sqrt{26}}{2}$

Attachments

qformula.wma