Solving Quadratics

(1.4)

What is a quadratic?

- Polynomial of 2nd degree
- Standard form: $ax^2 + bx + c = 0$
- graph is parabolic

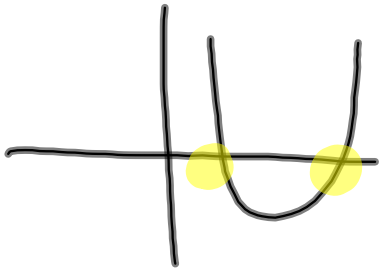
2 solutions!

To Solve Quadratics

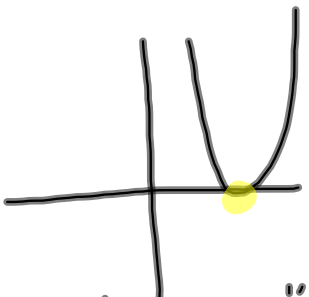
- Quadratic Formula
- Factoring
- Graphing
- Square rooting (if b = 0)
- Completing the square

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

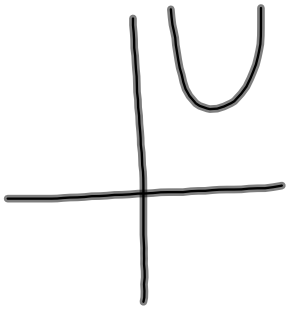
- Solution
- intercepts
- zero's



2 real sol.



"bouncer"
2 repeated sol.



2 imag. sol.

Discriminant:

$b^2 - 4ac$

$b^2 - 4ac$	positive	two solutions
$b^2 - 4ac$	zero	one solution
$b^2 - 4ac$	negative	no *real* solution

real

perfect square

2 rational sol. * factor nicely

repeated "bouncer"

2 imaginary sol.

Solve by factoring.

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

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

$(2x + 1)(x - 3) = 0$

$2x + 1 = 0 \qquad x - 3 = 0$

$x = -\frac{1}{2} \qquad x = 3$

Zero product property

$x \cdot y = 0$

$x = 0$ or $y = 0$

discriminant

$25 - 4(2)(-3)$

49

$$x^2+8x = 4$$

$$9x^2 - 25 = 0$$

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

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

$9x^2=25$

$x^2=\frac{25}{9}$

$x=\pm\sqrt{\frac{25}{9}}$

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

$$(x - 3)^2 = 7$$

$x - 3 = \pm\sqrt{7}$

$x = 3 \pm \sqrt{7}$

Completing the square:

-force a quadratic to become a perfect square trinomial

- leading coeffecient must be 1 (a = 1)

$$6x = 4 - x^2$$

$x^2 + 6x - 4 = 0$ ← Discriminant $36 - 4(1)(-4)$ 52

$x^2 + 6x + 9 = 4 + 9$

$(x + 3)^2 = 13$

$x + 3 = \pm\sqrt{13}$

$x = -3 \pm \sqrt{13}$

$$3x^2 - 18x + 25 = 0$$

$3x^2 - 18x = -25$

$3(x^2 - 6x + 9) = -25 + 27$

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

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

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

$$9x^2 - 12x = 14$$

$9x^2 - 12x + 4 = 14 + 4$

$(3x-2)^2 = 18$

$3x - 2 = \pm\sqrt{18}$

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

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

Solve using any method:

$$3x + 4 = 2x^2 - 7$$

$-2x^2 + 3x + 11$

$$x = \frac{-3 \pm \sqrt{97}}{-4}$$

Discriminant

$9 - 4(-2)(11)$

$9 + 88$

97 doesn't factor nicely!

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

$$x^2+\frac{b}{a}x+\frac{c}{a}=0$$

$$x^2+\frac{b}{a}x+\frac{b^2}{4a^2}=-\frac{c}{a}\cdot\frac{4a}{4a}+\frac{b^2}{4a^2}$$

$\frac{b}{a}\cdot\frac{1}{2}\left(\frac{b}{2a}\right)^2$

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

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

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