

Section 6-4  
Quadratic Formula

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

$$(x + 6)(x - 3) = 0$$

$$x = -6, x = 3$$

This works by factoring!

Now Try:  $x^2 - 2x + 5 = 0$

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

Cannot solve via factoring!

all quadratic equations of  
the form  $ax^2 + bx + c = 0$

can be solved. use the Quadratic  
Formula.

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

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Ex 1

$$x^2 - 7x = 18$$

$$-18 \quad -18$$

$$x^2 - 7x - 18 = 0$$

$$a=1 \quad b=-7 \quad c=-18$$

$$X = \frac{7 \pm \sqrt{49 - 4(1)(-18)}}{2}$$

$$X = \frac{7 \pm \sqrt{49 - -72}}{2}$$

$$X = \frac{7 \pm \sqrt{121}}{2}$$

\* The discriminant is the  $b^2 - 4ac$  part, under the square root. If it's greater than 0 and a perfect square, you get 2 real, rational roots. Crosses x-axis twice.

$$x = \frac{7 \pm \sqrt{121}}{2}$$

$$x = \frac{7 \pm 11}{2}$$

$$x = \frac{7+11}{2}, \quad x = \frac{7-11}{2}$$

$$x = 9, \quad x = -2$$

Ex 2  $x^2 + 9x - 11 = 0$

$$a = 1 \quad b = 9 \quad c = -11$$

$$x = \frac{-9 \pm \sqrt{81 - 4(1)(-11)}}{2}$$

$$x = \frac{-9 \pm \sqrt{125}}{2}$$

\* Discriminant is  $> 0$   
Not a perfect square. Two  
real roots, irrational, cross  
x-axis twice.

$$x = \frac{-9 \pm \sqrt{125}}{2} \rightarrow \sqrt{25} \sqrt{5}$$

$$x = \frac{-9 \pm 5\sqrt{5}}{2}$$

$$x = \frac{-9 + 5\sqrt{5}}{2}, \frac{-9 - 5\sqrt{5}}{2}$$

Actual  
Solutions

$$\frac{-9 + 11}{2}$$

$$\frac{-9 - 11}{2}$$

$$x \approx 1$$

$$x \approx -10$$

approximate  
check with graph

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

Ex3

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

$$a = -3 \quad b = 4 \quad c = -4$$

$$x = \frac{-4 \pm \sqrt{16 - 4(-3)(-4)}}{-6}$$

$$x = \frac{-4 \pm \sqrt{16 - 48}}{-6}$$

$$x = \frac{-4 \pm \sqrt{-32}}{-6} \rightarrow \sqrt{-1} \cdot \sqrt{16} \cdot \sqrt{2}$$

\* Discriminant is negative  
get 2 imaginary roots, doesn't  
cross x-axis.

$$x = \frac{-4 \pm 4i\sqrt{2}}{-6}$$

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

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

Ex 4

$$x^2 - 8x + 16 = 0$$

$$a = 1 \quad b = -8 \quad c = 16$$

$$x = \frac{8 \pm \sqrt{64 - 4(1)(16)}}{2}$$

$$x = \frac{8 \pm \sqrt{0}}{2}$$

\* Discriminant of Zero,  
1 real root, crosses x-axis once

$$x = \frac{8}{2} = 4$$

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