

4-7

The Discriminant

$$ax^2 + bx + c = 0 \rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-3 \pm \sqrt{-25}}{2} = \frac{-3 \pm 5i}{2}$$

discriminant

Value of the Discriminant	# and type of solutions	Graph
$b^2 - 4ac > 0$	2 real solutions	
$b^2 - 4ac = 0$	1 real solution	
$b^2 - 4ac < 0$	2 imaginary solutions (0 real sol.)	

Examples: Find the discriminant.  $b^2 - 4ac$   
Determine the number and type of solutions

a.  $-x^2 + 14x + c = 49$

$$-x^2 + 14x - 49 = 0$$

$a = -1$   $b = 14$   $c = -49$

$$b^2 - 4ac = (14)^2 - 4(-1)(-49)$$

$$196 - 196 = 0$$

b.  $2x^2 - 3x + 7 = 0$

$a = 2$   $b = -3$   $c = 7$

$$b^2 - 4ac$$

$$(-3)^2 - 4(2)(7)$$

c.  $9x^2 - 6x + 5 = 7$

$$9x^2 - 6x - 2 = 0$$

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

$a = 1$   $b = -6$   $c = -5$

$b^2 - 4ac$  | # type

0, 1 real solution

-47, 2 imaginary solution

56 → 2 real solutions

## Sec. 4-6 Completing the Square

Problem 1 : Solve

$$a. \quad \begin{array}{r} 3x^2 + 5 = 20 \\ -5 \quad -5 \end{array}$$

$$x^2 = 25$$

$$x = \pm 5$$

$$\frac{3x^2}{3} = \frac{15}{3}$$

$$x^2 = 5$$

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

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

$$b. \quad \begin{array}{r} 8x^2 - 3 = 29 \\ +3 \quad +3 \end{array}$$

$$\frac{8x^2}{8} = \frac{32}{8}$$

$$x^2 = 4$$

$$\sqrt{x^2} = \pm \sqrt{4}$$

$$x = \pm 2 \rightarrow 2, -2$$

Problem 2: Solve.

$$a. x^2 + 12x + 36 = 9$$

$$(x + 6)^2 = 9$$

$$\sqrt{(x+6)^2} = \pm\sqrt{9}$$

$$x + 6 = \pm 3$$

$$\underline{-6 \quad -6}$$

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

$$x = -3, -9$$

Problem 3:

What completes the square for

$$a. x^2 + 14x + \underline{49}$$

$$(x + 7)^2$$

$$b. x^2 + 6x + \underline{9}$$

$$(x + 3)^2$$

$$c. x^2 - 10x + \underline{25}$$

$$(x - 5)^2$$

$$d. x^2 - 7x + \underline{\frac{49}{4}}$$

$$(x - \frac{7}{2})^2$$

$$e. x^2 + 11x + \underline{\frac{121}{4}}$$

$$(x + \frac{11}{2})^2$$

Problem 4:

$$(x+3)(x+3)$$

$$x^2 + \underbrace{3x + 3x}_{6x} + 9$$

Solve

$$a. \quad x^2 + 6x - 3 = 0$$

$$\frac{x^2 + 6x \quad +9 = 3 \quad +9}{+3 \quad +3}$$

$$(x+3)^2 = 12$$

$$\sqrt{(x+3)^2} = \pm\sqrt{12} \left( \begin{array}{l} 4 \\ 2 \\ 3 \end{array} \right)$$

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

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

$$-3 + 2\sqrt{3}, -3 - 2\sqrt{3}$$