

Algebra 1

Lesson 10.7

Interpret the Discriminant

Warm-Up

Solve by completing the square or the quadratic formula.

$a=1$
 $b=-5$
 $c=-14$
 (a) $x^2 - 5x = 14$
 $x^2 - 5x + 14 = 0$

$a=1$
 $b=1$
 $c=1$
 (b) $x^2 + x + 1 = 0$
 $x = \frac{-1 \pm \sqrt{1^2 - 4(1)(1)}}{2(1)}$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-14)}}{2(1)}$$

$$x = \frac{5 \pm \sqrt{25 + 56}}{2}$$

$$x = \frac{5 \pm \sqrt{81}}{2}$$

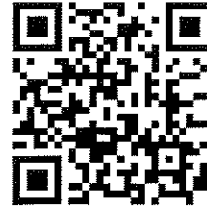
$$x = 7, -2$$

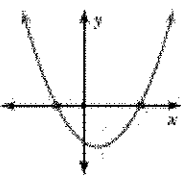
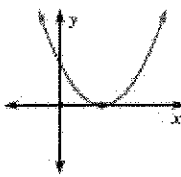
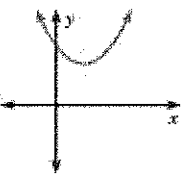
$$x = \frac{-1 \pm \sqrt{-3}}{2}$$

No Real Solution

Forgot how to solve using completing the square?

Forgot how to solve using the quadratic formula?



KEY CONCEPT		For Your Notebook		
Using the Discriminant of $ax^2 + bx + c = 0$				
Value of the discriminant	$b^2 - 4ac > 0$	$b^2 - 4ac = 0$	$b^2 - 4ac < 0$	
Number of solutions	Two solutions	One solution	No solution	
Graph of $y = ax^2 + bx + c$				
	Two x-intercepts	One x-intercept	No x-intercept	

DISCRIMINANT

$$b^2 - 4ac$$

Example 1. Evaluate the Discriminant

For each equation find a , b and c and evaluate the discriminant.

(a) $3x^2 + 8x + 7 = 0$

$$\begin{matrix} a = 3 \\ b = 8 \\ c = 7 \end{matrix}$$

$$b^2 - 4ac$$

$$(8)^2 - 4(3)(7)$$

$$64 - 84$$

$$-20$$

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

$$\begin{matrix} a = 1 \\ b = 2 \\ c = -3 \end{matrix}$$

$$b^2 - 4ac$$

$$(2)^2 - 4(1)(-3)$$

$$4 + 12$$

$$16$$

(c) $4x^2 + 20x + 29 = 4$

$$\begin{matrix} a = 4 \\ b = 20 \\ c = 25 \end{matrix}$$

$$4x^2 + 20x + 25 = 0$$

$$b^2 - 4ac$$

$$(20)^2 - 4(4)(25)$$

$$400 - 400$$

$$0$$

Example 2. Use the Discriminant to Find the Number of Solutions

For each equation find a , b and c and evaluate the discriminant. Then tell whether the equation has *two solutions*, *one solution* or *no solution*.

PDW

(a) $x^2 + 4x + 3 = 0$

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

$$b^2 - 4ac$$

$$(4)^2 - 4(1)(3)$$

$$16 - 12$$

$$4$$

2 SOLUTIONS

(b) $2x^2 + 6 = 5x$

$a = 2$
$b = -5$
$c = 6$

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

$$b^2 - 4ac$$

$$(-5)^2 - 4(2)(6)$$

$$25 - 48$$

$$-23$$

NO REAL SOLUTION

(c) $-x^2 + 2x = 1$

$a = -1$
$b = 2$
$c = -1$

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

$$b^2 - 4ac$$

$$(2)^2 - 4(-1)(-1)$$

$$4 - 4$$

1 SOLUTION

Example 3. Finding Solutions by Graphing (x-intercepts)

Consider the function $y = x^2 + 6x + 8$

(a) Use the discriminant to determine the number of x-intercepts (solutions).

$a = 1$ $b = 6$ $c = 8$

$$b^2 - 4ac$$

$$(6)^2 - 4(1)(8)$$

$$36 - 32 = 4$$

2 SOLUTIONS

$$0 = x^2 + 6x + 8$$

(b) Find and sketch the axis of symmetry and vertex.

$$x = \frac{-b}{2a} = \frac{-(6)}{2(1)} = -3$$

VERTEX

$$y = (-3)^2 + 6(-3) + 8$$

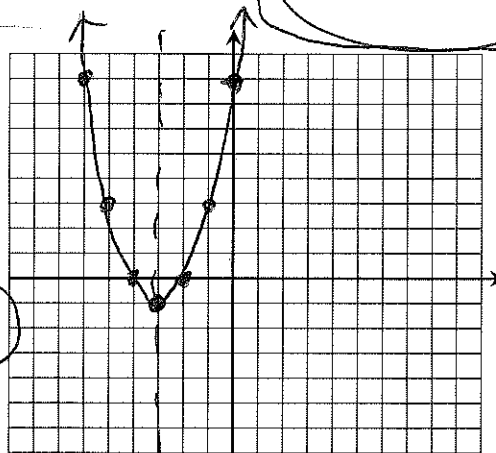
$$y = 9 - 18 + 8$$

$$y = -1$$

A.O.S. $x = -3$

(c) Make a table of values to plot additional points.

x	-5	-4	-3	-2	-1
y	3	0	-1	0	3



(d) Find the x-intercepts (solutions).

$x = -4, -2$

$$y = (-2)^2 + 6(-2) + 8$$

$$y = 4 - 12 + 8$$

$$y = 0$$

$$y = (-1)^2 + 6(-1) + 8$$

$$y = 1 - 6 + 8$$

$$y = 3$$

Homework

New: Pg. 681 #6-26 (evens)

Review:

Solve by *taking the square root*.

1. $2x^2 = 32$

2. $x^2 + 100 = 0$

3. $\frac{1}{2}x^2 + 32 = 0$

4. $(x + 1)^2 = 25$

Helpful video on the discriminant

