

Name:

Date:

Topic: The Discriminant

Class/Period:

Goal: Using the discriminant to determine how many real solutions a Quadratic Function has

Questions/Main Ideas:

Notes:

### The Quadratic Formula

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

The argument of the square root, the expression  $b^2 - 4ac$ , is called the "discriminant" because, by using its value, you can discriminate between (tell the differences between) the various solution types.

Discriminant:  $b^2 - 4ac$

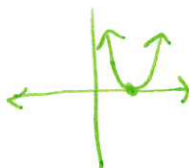
- If the discriminant is positive = 2 real solution...Then solve



- If the discriminant is negative = no solutions.....Then you are DONE!!



- If the discriminant is zero = 1 solution...Then Solve



Example 1: Determine the number of solutions  $x^2 + 4x = 3$

Example 2: Determine the number of solutions  $2x^2 - 5x + 6 = 0$

Example 3: Determine the number of solutions  $-x^2 + 2x = -1$

Example 4: Determine the number of solutions  $7x^2 + 56x - 7 = 8x$

To find the number of solutions you still need to set the equation equal to zero and find the a, b, c's.

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

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

$$a = 1$$

$$b = 4$$

$$c = -3$$

$$b^2 - 4ac$$

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

$$16 + 12 = 28$$

The discriminant is positive.  
2 solutions

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

$$a = 1$$

$$b = 4$$

$$c = -3$$

$$x = \frac{-4 \pm \sqrt{28}}{2(1)} = \frac{-4 \pm \sqrt{28}}{2}$$

$$\frac{-4 + \sqrt{28}}{2} = \boxed{.646}$$

$$\frac{-4 - \sqrt{28}}{2} = \boxed{-4.65}$$

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

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

$$a = 2 \quad b^2 - 4ac$$

$$b = -5 \quad (-5)^2 - 4(2)(6)$$

$$c = 6$$

$$25 - 48 = -23$$

The discriminant is negative =  
no solution

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

$$a = 1 \quad b^2 - 4ac$$

$$b = -6 \quad (-6)^2 - 4(1)(9)$$

$$c = 9$$

$$36 - 36 = 0$$

The discriminant is zero =  
1 solution

$$\text{Solve: } x^2 - 6x + 9 = 0$$

$$= \frac{-(-6) \pm \sqrt{0}}{2(1)}$$

$$\begin{array}{r} 9 \\ \times \\ -\frac{x}{3} \quad -\frac{x}{3} \\ \hline -6 \end{array}$$

$$\text{or } x = \frac{6}{2} = \boxed{3}$$

$$\begin{array}{r} 9 \\ 3 \overline{) 3} \\ -3 \overline{) 3} \\ \hline (x-3)^2 \\ \boxed{x=3} \end{array}$$





$$7x^2 + 56x - 7 = 8x$$

$$7x^2 + 56x - 7 = 8x$$

$$7x^2 + 56x - 8x - 7 = 0$$

$$7x^2 + 48x - 7 = 0$$

$$a=7$$

$$b^2 - 4ac$$

$$b=48$$

$$(48)^2 - 4(7)(-7)$$

$$c=-7$$

$$2304 + 196 = 2500$$

The discriminant is positive = 2 solutions

Solve:

$$7x^2 + 48x - 7 = 0$$

$$\text{OR } x = \frac{-48 \pm \sqrt{2500}}{2(7)}$$

$$\begin{array}{r} -49 \\ \cancel{\frac{7x}{-1}} \quad \cancel{\frac{7x}{49}} \\ 48 \end{array}$$

$$x = \frac{-48 \pm \sqrt{2500}}{14}$$

$$\begin{array}{r} -49 \\ 1 \overline{) 49} \\ -1 \overline{) 49} = 48 \end{array}$$

$$x = \frac{-48 + 50}{14} = \frac{2}{14} = \frac{1}{7}$$

$$(7x-1)(x+7) = 0$$

$$7x-1 =$$

$$\boxed{x = -7}$$

$$\frac{7x}{7} = \frac{1}{7}$$

$$\boxed{x = \frac{1}{7}}$$

$$x = \frac{-48 - 50}{14} = \boxed{-7}$$

Summary:

1/7