

DISTANCE LEARNING – ASSIGNMENT #5

This packet is a review of using the discriminant to find the number of solutions in a quadratic equation. It is very important that you attend class on Tuesday and/or Thursday to help you understand the material, as well as give you the chance to ask any questions.

PART ONE – WHAT IS THE DISCRIMINANT?

- The discriminant is a piece of the quadratic formula that can be used to determine HOW MANY solutions a quadratic equation has, but NOT to find the actual solutions of the equations.
- Remember, a quadratic equation can have up to TWO solutions, but no more than two.
- The questions in this assignment will ask you to tell how many solutions the equations has, not WHAT the solutions are.
- Like all other quadratic equation problems, the equation must be set equal to zero AND in standard form before you can use the discriminant to answer the question.

EXAMPLE 1:

HOW MANY solutions does the quadratic equation have?

$$x^2 - 5x - 14 = 0$$

FIRST: Let's remind ourselves what the discriminant is, and how to identify the variables involved in the formula.

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

The discriminant is ONLY the portion of the Quadratic formula that is under the square root.

$$b^2 - 4ac$$

a is the number in front of x^2

b is the number in front of x

c is the number without a variable (the constant)

SECOND: Let's make sure that the equation we are given is set equal to zero and in standard form. Since it is, we can list the values of each variable, according to your given equation

$$a = 1$$

$$b = -5$$

$$c = -14$$

THIRD: We can now plug these numbers into the discriminant formula. The number we get will help us determine the number of solutions the equation has.

$$\begin{aligned} \text{discriminant} &= b^2 - 4ac \\ &= (-5)^2 - 4(1)(-14) \\ &= 25 + 56 \\ &= 81 \text{ ---} \rightarrow \text{THIS IS THE DISCRIMINANT} \end{aligned}$$

FOURTH: Now, we will use this number AND look at the table below to help us determine the number of solutions the equation has.

DISCRIMINANT	# OF SOLUTIONS
Positive number	2 solutions
Zero	1 solution
Negative number	No solution

Since the discriminant we found was 81, we identify it as a positive number. According to the chart, this means the equation has

TWO SOLUTIONS.

This is your answer.

EXAMPLE 2:

Use the discriminant to determine the number of solutions the equation has.

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

FIRST: Let's remind ourselves what the discriminant is, and how to identify the variables involved in the formula.

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

The discriminant is **ONLY** the portion of the Quadratic formula that is under the square root.

$$b^2 - 4ac$$

a is the number in front of x^2

b is the number in front of x

c is the number without a variable (the constant)

SECOND: Let's make sure that the equation we are given is set equal to zero and in standard form. Since it is **NOT**, we must rearrange the equation before we can list the values of each variable.

$$\begin{aligned} -2x^2 - x - 1 &= 0 \\ a &= -2 \\ b &= -1 \\ c &= -1 \end{aligned}$$

THIRD: We can now plug these numbers into the discriminant formula. The number we get will help us determine the number of solutions the equation has.

$$\begin{aligned} \text{discriminant} &= b^2 - 4ac \\ &= (-1)^2 - 4(-2)(-1) \\ &= 1 - 8 \\ &= -9 \text{ ---} \rightarrow \text{THIS IS THE DISCRIMINANT} \end{aligned}$$

FOURTH: Now, we will use this number **AND** look at the table below to help us determine the number of solutions the equation has.

DISCRIMINANT	# OF SOLUTIONS
Positive number	2 solutions
Zero	1 solution
Negative number	No solution

Since the discriminant we found was -9, we identify it as a positive number.
According to the chart, this means the equation has

NO SOLUTION.

This is your answer.

EXAMPLE 3:

HOW MANY solutions does the quadratic equation have?

$$-2x^2 - 8x - 14 = -6$$

FIRST: Let's remind ourselves what the discriminant is, and how to identify the variables involved in the formula.

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

The discriminant is ONLY the portion of the Quadratic formula that is under the square root.

$$b^2 - 4ac$$

a is the number in front of x^2

b is the number in front of x

c is the number without a variable (the constant)

SECOND: Let's make sure that the equation we are given is set equal to zero and in standard form. Since it is NOT, we must rearrange the equation before we can list the values of each variable.

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

$$a = -2$$

$$b = -8$$

$$c = -8$$

THIRD: We can now plug these numbers into the discriminant formula. The number we get will help us determine the number of solutions the equation has.

$$\begin{aligned} \text{discriminant} &= b^2 - 4ac \\ &= (-8)^2 - 4(-2)(-8) \\ &= 64 - 64 \end{aligned}$$

= 0 ---→ THIS IS THE DISCRIMINANT

FOURTH: Now, we will use this number AND look at the table below to help us determine the number of solutions the equation has.

DISCRIMINANT	# OF SOLUTIONS
Positive number	2 solutions
Zero	1 solution
Negative number	No solution

Since the discriminant we found was 0, we identify it as a positive number.
According to the chart, this means the equation has

ONE SOLUTION.

This is your answer.

ASSIGNMENT: Use the discriminant to determine the number of solutions the quadratic equation has.

1. $9x^2 + 6x + 6 = 5$

2. $-9x^2 = -8x + 8$

3. $-x^2 - 9 = 6x$

4. $-6x^2 - 6 = -7x - 9$