Name: ___Kevin Braza - KEY______________________________ Date: __________________ IB Math A&A SL

Lesson 2.3 – Analyzing Graphs of Quadratic Functions, Using the Discriminant

I. Warm-Up

1. Graph the function $f(x) = x^2 + 8x + 19$ on your calculator. Are there any zeroes?

The function does not touch the x-axis at any point.

2. Solve the equation below: (*Complete the square or use the quadratic formula).*

$-2x^2 - 12x - 19 = 0$

$-2(x^2 - 6x) - 19 = 0$

$-2(x^2 - 6x\ [+9 - 9]) - 19 = 0$

$-2((x-3)^2 - 9) - 19 = 0$

$-2(x-3)^2 + 18 - 19 = 0$

$-2(x-3)^2 - 1 = 0$

$-2(x-3)^2 = 1$

$(x-3)^2 = -\frac{1}{2}$

No Solution

II. Using the Discriminant

3. For each of the following, use the quadratic formula to find the roots of the equation. What do you notice about the value under the square root?

$y = x^2 - 2x - 3$

2 solutions

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

1 solution

$y = x^2 - 2x + 3$

0 solutions

The Discriminant:

(The value underneath the square root in the quadratic formula will tell the number of real solutions to the quadratic equation.)

$b^2 - 4ac > 0$

2 solutions

$b^2 - 4ac = 0$

1 solution

$b^2 - 4ac < 0$

0 solutions

4. Use the discriminant to determine the relationship between each function and the x-axis. State how many zeroes each function will have.

a. $y = x^2 + 3x + 4$

$(3)^2 - 4(1)(4) = 9 - 16 \rightarrow$ negative. Function has no real solutions.

b. $y = -2x^2 + 5x + 1$

$(5)^2 - 4(-2)(1) = 25 + 8 \rightarrow$ positive. Function has two real solutions.

5. Find the values of k for which the function $y = x^2 - 6x + k$.

a. Crosses the x-axis twice

$(-6)^2 - 4(1)(k) > 0$ $\quad$ $36 > 4k$

$36 - 4k > 0$ $\quad$ $k < 9$

b. Touches the x-axis once

$(-6)^2 - 4(1)(k) = 0$ $\quad$ $36 = 4k$

$36 - 4k = 0$ $\quad$ $k = 9$

c. Does not cross the x-axis

$(-6)^2 - 4(1)(k) < 0$ $\quad$ $36 < 4k$

$36 - 4k < 0$ $\quad$ $k > 9$