Name: Key Date: 12/8/17

CC ALGEBRA 2 TROICI

LESSON #6: DISCRIMINANT

Do Now:

a) According to what ROW you sit in, solve one of the quadratic equations below by using the Quadratic Formula. Express answer(s) in *simplest radical form* (if applicable).

b) Describe the answers you obtained in part (a) by selecting the appropriate word(s) from the box below.

REAL	IMAGINARY	RATIONAL	IRRATIONAL	EQUAL	UNEQUAL

ROW 1

1) $x^2 + 4x + 4 = 0$

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

$$x = \frac{-4 \pm \sqrt{0}}{2}$$

$$x = \frac{-4}{2}$$

$$\boxed{x = -2}$$

← 1 solution

ROW 2

2) $x^2 - 3x - 10 = 0$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-10)}}{2(1)}$$

$$x = \frac{3 \pm \sqrt{49}}{2}$$

$$x = \frac{3 \pm 7}{2}$$

$$\boxed{x = 5, -2}$$

← 2 rational solutions

ROW 3

3) $x^2 + 6x - 2 = 0$

$$x = \frac{-(+6) \pm \sqrt{(6)^2 - 4(1)(-2)}}{2(1)}$$

$$x = \frac{-6 \pm \sqrt{44}}{2}$$

$$x = \frac{-6 \pm 2\sqrt{11}}{2}$$

$$\boxed{x = -3 \pm \sqrt{11}}$$

← 2 irrational solutions

ROW 4

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

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

$$x = \frac{+2 \pm \sqrt{-12}}{2}$$

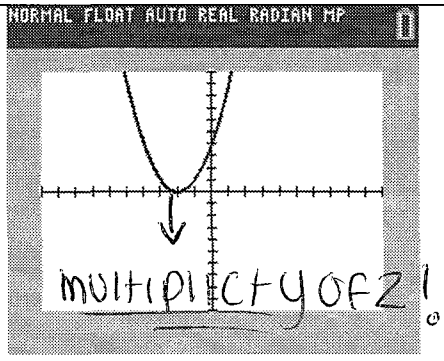
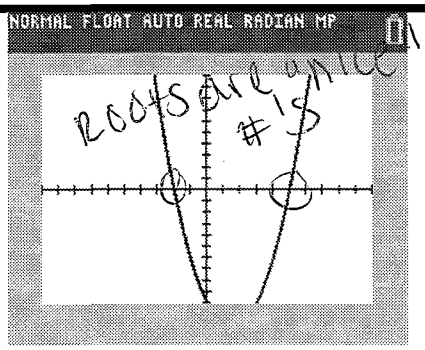
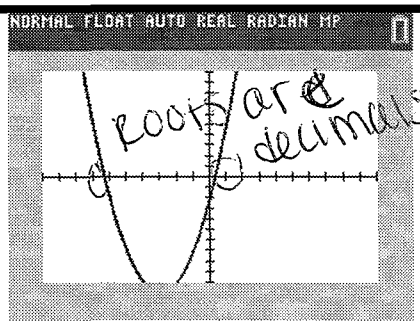
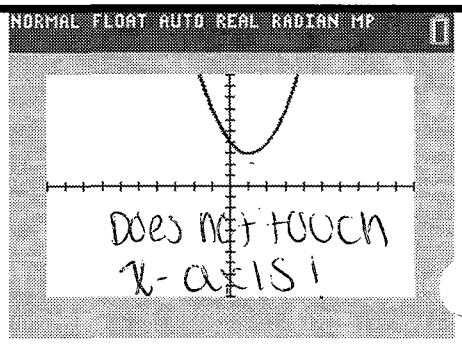
$$x = \frac{2 \pm 2i\sqrt{3}}{2}$$

$$\boxed{x = 1 \pm i\sqrt{3}}$$

← 2 imaginary solutions

DISCRIMINANT CHART: $b^2 - 4ac$

how many, real or imaginary, rational or irrational

Quadratic Equation	Value of Discriminant	Nature of Roots	Graph
$x^2 + 4x + 4 = 0$	$b^2 - 4ac$ $4^2 - [4(1)(4)] =$ $16 - 16 = \boxed{0}$ ↳ ZERO!	real, rational, equal	
$x^2 - 3x - 10 = 0$	$(-3)^2 - [4(1)(-10)]$ $9 - -40$ $\boxed{49}$ ↳ perfect square!	real, rational unequal	
$x^2 + 6x - 2 = 0$	$(6)^2 - 4(1)(-2)$ $36 - -8$ $\boxed{44}$ ↳ NOT a perfect square	real, irrational unequal	
$x^2 - 2x + 4 = 0$	$(-2)^2 - 4(1)(4)$ $4 - 16 =$ $\boxed{-12}$ ↳ negative!	imaginary!	

DISCRIMINANT PRACTICE

1) The roots of a quadratic equation are real, rational, and equal when the discriminant is
   (1) -2 (3) 0
   (2) 2 (4) 4

   zero!

2) Which number is the discriminant of a quadratic equation whose roots are real, unequal, and irrational? → non perfect square
   (1) 0 (3) 7
   (2) -5 (4) 4

3) Jacob is solving a quadratic equation. He executes a program on his graphing calculator and sees that the roots are real, rational, and unequal. This information indicates to Jacob that the discriminant is
   (1) zero (3) a perfect square
   (2) negative (4) not a perfect square

   perf. square

4) The roots of the equation $x^2 - 3x - 2 = 0$ are
   (1) real, rational, and equal
   (2) real, rational, and unequal
   (3) real, irrational, and unequal
   (4) imaginary

   $(-3)^2 - 4(1)(-2)$
   $9 - -8$
   17

5) The roots of the equation $5x^2 - 2x + 1 = 0$ are
   (1) real, rational, and equal
   (2) real, rational, and unequal
   (3) real, irrational, and unequal
   (4) imaginary

   $(-2)^2 - 4(1)(5)$
   -16
   NEGATIVE!

6) The roots of the equation $2x^2 - 24x + 72 = 0$ are
   (1) real, rational, and equal
   (2) real, rational, and unequal
   (3) real, irrational, and unequal
   (4) imaginary

   $(-24)^2 - 4(2)(72)$
   0

7) The roots of the equation $4x^2 + 14x = 0$ are
   (1) real, rational, and equal
   (2) real, rational, and unequal
   (3) real, irrational, and unequal
   (4) imaginary

   $(14)^2 - 4(4)(0)$
   196

   ★ c=0!

8) Which statement must be true if a parabola represented by the equation $y = ax^2 + bx + c$ does *not* intersect the *x*-axis?

(1) $b^2 - 4ac = 0$

(2) $b^2 - 4ac < 0$

(3) $b^2 - 4ac > 0$, and $b^2 - 4ac$ is a perfect square.

(4) $b^2 - 4ac > 0$, and $b^2 - 4ac$ is not a perfect square.

9) If the roots of $ax^2 + bx + c = 0$ are real, rational, and equal, what is true about the graph of the function $y = ax^2 + bx + c$?

(1) It intersects the *x*-axis in two distinct points.

(2) It lies entirely below the *x*-axis.

(3) It lies entirely above the *x*-axis.

(4) It is tangent to the *x*-axis.

10) Which equation has real, rational, and equal roots? → DISCRIM = 0!

(1) $x^2 + 6x + 1 = 0$ $6^2 - 4(1)(1) = 32$

(2) $x^2 - 6x + 9 = 0$ $(-6)^2 - 4(1)(9) = 0$

(3) $x^2 + 7x - 10 = 0$ $(7)^2 - 4(1)(-10) = 89$

(4) $5x^2 + 5 = 0$ $(0)^2 - 4(5)(5) = -100$

11) Which equation has roots that are irrational? NOT a perfect square!

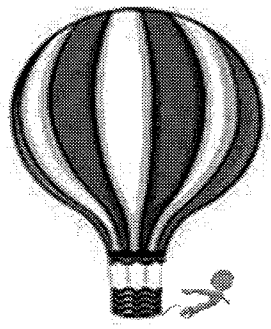
(1) $x^2 - 4 = 0$ $(0)^2 - 4(1)(-4) = 16$

(2) $x^2 - 4x - 5 = 0$ $(-4)^2 - 4(1)(-5) = 36$

(3) $x^2 - 5x + 2 = 0$ $(-5)^2 - 4(1)(2) = 17$

(4) $x^2 + 7x + 12 = 0$ $(7)^2 - 4(1)(12) = 1$

12) You and a friend want to go bungee-jumping from a hot-air balloon. Before you jump, you want to make sure the balloon is high enough so you don't hit your head on the ground during the jump. You were told that the elasticity of the bungee can be modeled by the quadratic equation, $y = x^2 - 20x + c$, where "*c*" represents the height of the hot air balloon (in feet). What is the *minimum* height (nearest integer) the balloon can be to ensure a safe jump without hitting the ground?



$b^2 - 4ac < 0$

$(-20)^2 - 4(1)(c) < 0$

$400 - 4c < 0$

$-4c < -400$

$c > 100$