

**NOTES:** **THE DISCRIMINANT**  
Created for you by Ms. Nhotsaubanh

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

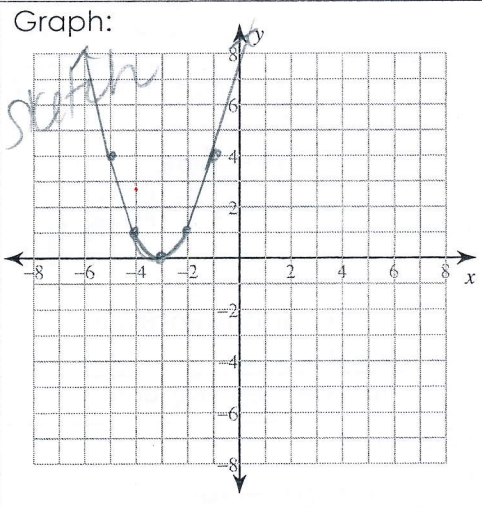
- The discriminant of a quadratic equation  $ax^2 + bx + c = 0$ , is found inside the square root of the quadratic formula:  $b^2 - 4ac$
- The discriminant tells us the number and what type of roots the quadratic equation has.

**HOW AND WHY DOES THE DISCRIMINANT WORK**

- Discriminant  $> 0 \rightarrow$  2 solutions
  - \* A perfect square - 2 rational roots
  - \* Not a perfect square - 2 irrational roots containing a radical
- Discriminant  $= 0 \rightarrow$  1 solution
- Discriminant  $< 0 \rightarrow$  0 real solutions
  - \* 2 imaginary roots

*a b c*  
 Example 1:  $x^2 + 10x + 25 = 0$   
 Discriminant:  
 $b^2 - 4ac$   
 $(10)^2 - 4(10)(25)$   
0  
 The discriminant is zero  
 (positive, negative, or zero)

*roots*  
 Solution(s):  
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
 $x = \frac{-(-10) \pm \sqrt{0}}{2(1)}$   
 $x = \frac{-10}{2} = -5$  *root*



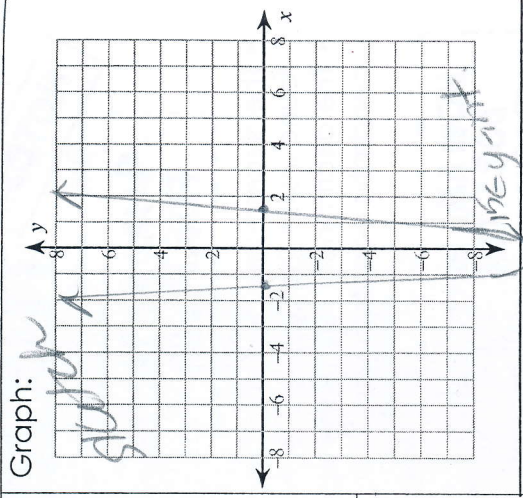
What does this mean?  
*1 root known as double root*

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Example 2:  $6x^2 + x - 15 = 0$   
 Discriminant:  
 $b^2 - 4ac$   
 $(1)^2 - 4(6)(-15)$

$36 + 1$   
 The discriminant is  
 positive, negative, or zero)

Solution(s):  
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
 $x = \frac{-(-1) \pm \sqrt{36+1}}{2(6)}$   
 $x = \frac{1 \pm 19}{12} = \frac{18}{12} = 1.5$   
 $\frac{-20}{12} = -1.6$

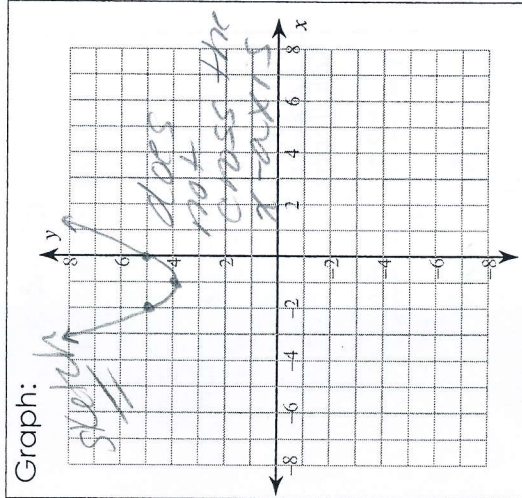


What does this mean?  
 2 roots

Example 3:  $x^2 + 2x + 5 = 0$   
 Discriminant:  
 $b^2 - 4ac$   
 $(2)^2 - 4(1)(5)$

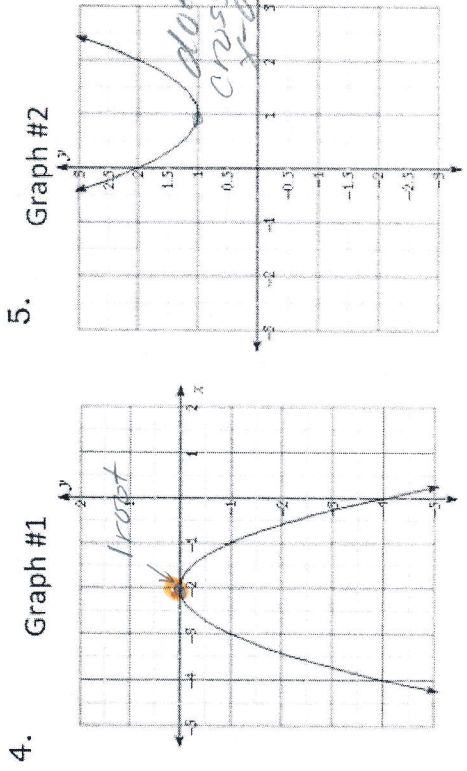
The discriminant is  
 negative, positive, or zero)

Solution(s):  
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
 $x = \frac{-(-2) \pm \sqrt{-16}}{2(1)}$   
 imaginary bc neg. inside the square root

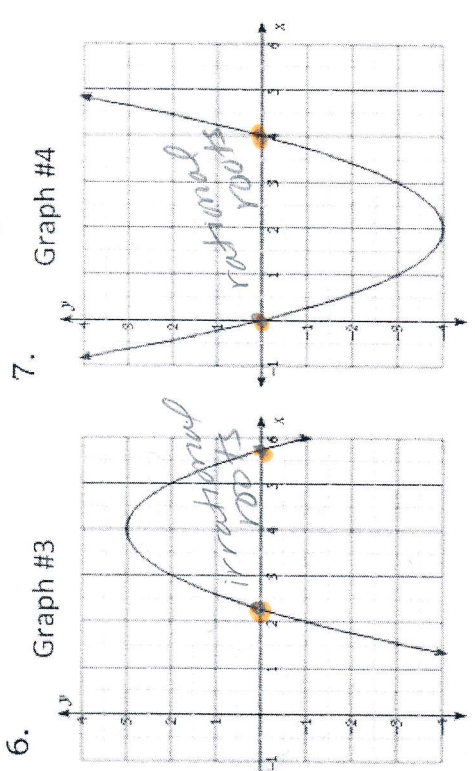


What does this mean?  
 2 imaginary roots or 0 real roots

State whether the discriminant of each quadratic equation is positive, negative, or equal to zero on the line below the graph. Then identify which graph matches the discriminants below:



zero  
 negative



positive  
 positive

Discriminant A:  $(-2)^2 - 4(1)(2) = -4$   
 Discriminant B:  $(-4)^2 - 4(-1)(-4) = 0$   
 Discriminant C:  $(-4)^2 - 4(1)(0) = 16$   
 Discriminant D:  $(-8)^2 - 4(-1)(-13) = 128$

Graph #1: 2  
 Graph #2: 4  
 Graph #3: 1  
 Graph #4: 3