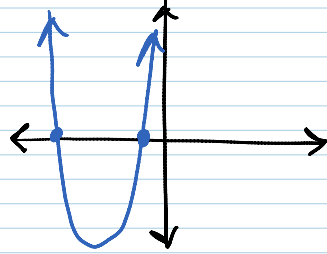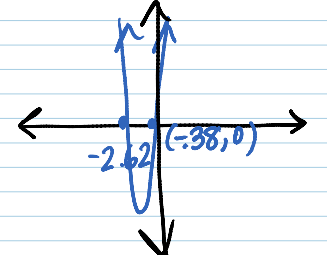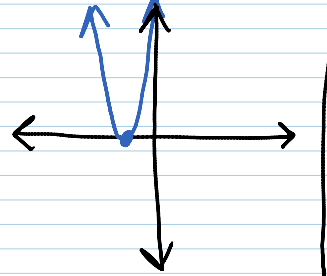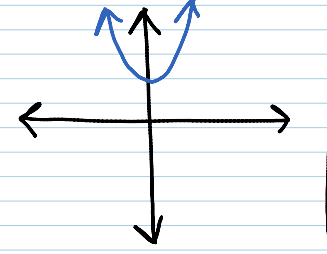# 10.7: The Discriminant

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

the discriminant

tells us how many solution (x-int, root, zero) the graph has

when $b^2 - 4ac > 0$ (discriminant is positive)	• If $b^2 - 4ac$ is a perfect square like $y = x^2 + 6x + 5$ a=1 b=6 c=5 $b^2 - 4ac$ $6^2 - 4(1)(5)$ $36 - 20$ 16 2 RATIONAL SOLUTIONS	
	• If $b^2 - 4ac$ is _NOT_ a perfect square like $y = x^2 + 3x + 1$ a=1 b=3 c=1 $b^2 - 4ac$ $3^2 - 4(1)(1)$ $9 - 4$ 5 2 IRRATIONAL solutions	
when $b^2 - 4ac = 0$	Like $y = x^2 + 2x + 1$ a=1 b=2 c=1 $b^2 - 4ac$ 1 SOLUTION $2^2 - 4(1)(1)$ (vertex) $4 - 4 = 0$	
when $b^2 - 4ac < 0$ (discriminant is negative)	Like $y = 2x^2 + x + 5$ a=2 b=1 c=5 $b^2 - 4ac$ 0 SOLUTIONS $1^2 - 4(2)(5)$ $1 - 40 = -39$	

Find the value of the discriminant. Then describe how many roots (& what kind, if possible) there are.

① $4x^2 + 4x + 1 = 0$

$a = 4 \quad b = 4 \quad c = 1$

$b^2 - 4ac$

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

$16 - 16$

0

1 SOLUTION

② $x^2 + 3x + 8 = 5$

$\underline{ -5 \quad -5}$

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

$a = 1 \quad b = 3 \quad c = 3$

$b^2 - 4ac$

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

$9 - 12$

-3

NO SOLUTIONS

③ $8x^2 + 18x - 5 = 0$

$a = 8 \quad b = 18 \quad c = -5$

$b^2 - 4ac$

$18^2 - 4(8)(-5)$

$324 + 160$

484

2 RATIONAL SOLUTIONS