

## NATURE OF THE ROOTS

$$x^2 - x - 6 = 0$$

$$(x - 3)(x + 2) = 0$$

$$x = 3 \text{ or } x = -2$$

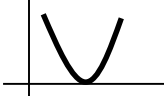
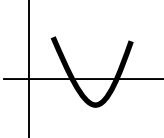
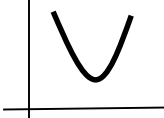
Roots (x-answers)

If  $ax^2 + bx + c = 0$   
then ....  
 $\Delta = b^2 - 4ac$

### NOTE:

- use  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$  to determine the **roots** of a quadratic equation
- use  $\Delta = b^2 - 4ac$  to determine the **nature of the roots** of a quadratic equation

### Theory:

$\Delta$ (Delta)		Roots are.....	Graph
$\Delta = 0$		REAL EQUAL RATIONAL	 Graph touches x-axis once. ( <b>one</b> x-intercept)
$\Delta > 0$	$\Delta = \text{perfect square}$	REAL UNEQUAL RATIONAL	 Graph passes through the x-axis TWICE. ( <b>two</b> x-intercepts)
	$\Delta \neq \text{perfect square}$	REAL UNEQUAL IRRATIONAL	
$\Delta < 0$		<b>NON-REAL</b>	 Graph DOES NOT touch the x-axis. ( <b>NO</b> x-intercept)

**ALWAYS** → Write the given equation in the STANDARD FORM  
→ Determine  $\Delta$ , then...

### 3 KINDS OF QUESTIONS:

1. Determine **the nature of the roots** of.....

- Standard form
- Determine  $\Delta$
- Use theory table

2. Nature of roots given, **determine the unknown**....

- Standard form
- Determine  $\Delta$
- Use theory table
- Solve equation

3. **Prove/show that** the roots are.....

- Standard form
- Determine  $\Delta$
- Explanation