

chapter **2** Algebra 2

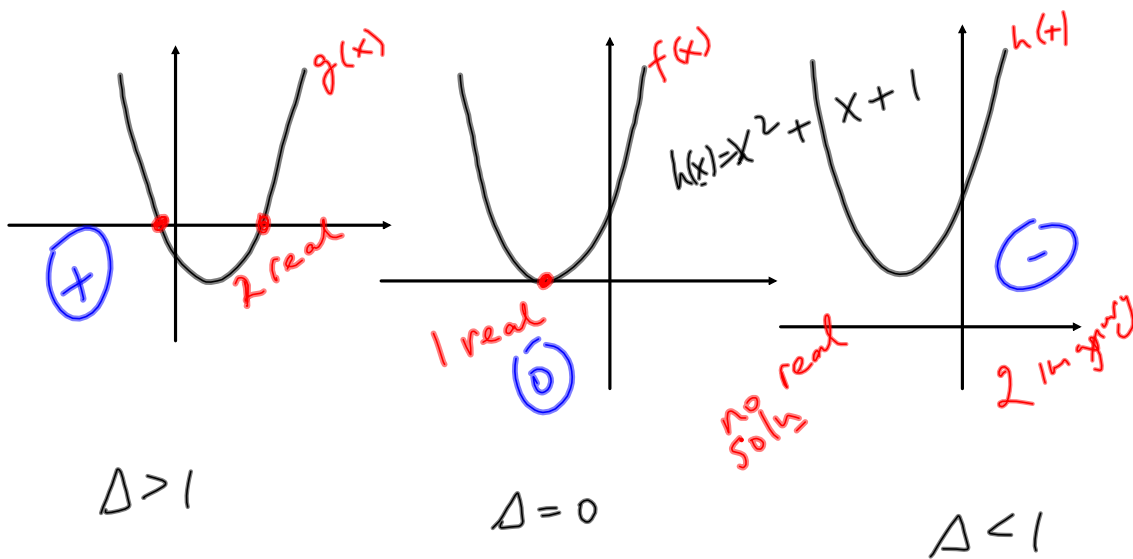
## Section 2.2 Nature of quadratic roots

PROJECT MATHS  
**Text & Tests 6**

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$$\Delta = b^2 - 4ac$$

$\Delta =$  Discriminant



Quadratic  
solns?

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

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

$$a = 1$$

$$b = 1$$

$$c = 1$$

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

$$= \frac{-1 \pm \sqrt{-3}}{2}$$

Since  $\sqrt{-3}$  is not real  
 $\Rightarrow$  no real roots!

1. If  $(b^2 - 4ac) > 0 \Rightarrow$  two different (distinct) real roots
2. If  $(b^2 - 4ac) = 0 \Rightarrow$  two equal real roots
3. If  $(b^2 - 4ac) < 0 \Rightarrow$  two imaginary roots
4. If  $(b^2 - 4ac)$  is a perfect square  $\rightarrow$  rational roots

### Example 1

Evaluate the discriminant of each of the following, stating whether the equation has

(i) two distinct real roots (ii) two identical real roots (iii) no real roots.

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

(b)  $49x^2 + 42x + 9 = 0$

(c)  $2x^2 + 8x + 9 = 0$

(d)  $2x^2 + 7x + 4 = 0$

(a)  $\Delta = b^2 - 4ac$

$a = 3$

$b = 5$

$c = -1$

$$\Delta = (5)^2 - 4(3)(-1)$$

$$= 25 + 12$$

$$= 37 ; \text{ positive } \Delta$$

$\Rightarrow$  2 real roots