

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

$$x^2 - 4x + 3 = 0$$

$$(x - 3)(x - 1) = 0$$

$$x = 3, x = 1$$

2 distinct roots

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

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

$$(x - 2)^2 = 0$$

$$x = 2$$

1 repeated root

$$x^2 - 4x + 7 = 0$$

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

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

$$(x - 2)^2 = -3$$

$$x = \frac{4 \pm \sqrt{4^2 - 4 \times 1 \times 7}}{2}$$

$$x - 2 = \pm\sqrt{-3}$$

$$x = \frac{4 \pm \sqrt{16 - 28}}{2}$$

$$x = 2 \pm \sqrt{-3}$$

$$x = \frac{4 \pm \sqrt{-12}}{2}$$

0 real roots

$$x^2 - 4x + 7 = 0$$

0 real roots

$$b^2 - 4ac = -12$$

$$x^2 - 4x + 3 = 0$$

2 distinct roots

$$b^2 - 4ac = 16 - 12 = 4$$

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

1 repeated root

$$b^2 - 4ac = 16 - 16 = 0$$

- $b^2 - 4ac > 0$, there are 2 distinct real roots
- $b^2 - 4ac = 0$, there is 1 repeated real root
- $b^2 - 4ac < 0$, there are 0 real roots

