

Section 2: The quadratic formula

Solutions to Exercise level 1

1. (i) $3x^2 + 2x + 5 = 0 \Rightarrow$ discriminant $= b^2 - 4ac$
 $= 4 - 4 \cdot 3 \cdot 5 < 0$
so no solutions

(ii) $2x^2 - 3x - 2 = 0 \Rightarrow$ discriminant $= b^2 - 4ac$
 $= 9 - 4(2)(-2) > 0$
so two solutions

(iii) $5x^2 - 6 = 0 \Rightarrow$ discriminant $= b^2 - 4ac$
 $= 0 - 4 \cdot 5(-6) > 0$
so two solutions

(iv) $4x^2 - 8x + 4 = 0 \Rightarrow$ discriminant $= b^2 - 4ac$
 $= 64 - 4(4)(4) = 0$
so two (equal) solutions

(v) $x^2 - 3x + 3 = 0 \Rightarrow$ discriminant $= b^2 - 4ac$
 $= 9 - 4 \cdot 1 \cdot 3 < 0$
so no solutions

(vi) $-5x^2 - 8x - 10 \Rightarrow$ discriminant $= b^2 - 4ac$
 $= 64 - 4(-5)(-10) < 0$
so no solutions

2. (i) $a = 1, b = 4, c = 1$
$$x = \frac{-4 \pm \sqrt{4^2 - 4 \times 1 \times 1}}{2 \times 1}$$
$$= \frac{-4 \pm \sqrt{12}}{2}$$
$$= \frac{-4 \pm 2\sqrt{3}}{2}$$
$$= -2 \pm \sqrt{3}$$

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$$(ii) \quad a=1, b=-3, c=-1$$

$$\begin{aligned}x &= \frac{3 \pm \sqrt{3^2 - 4 \times 1 \times -1}}{2 \times 1} \\ &= \frac{3 \pm \sqrt{13}}{2}\end{aligned}$$

$$(iii) \quad a=2, b=2, c=-3$$

$$\begin{aligned}x &= \frac{-2 \pm \sqrt{2^2 - 4 \times 2 \times -3}}{2 \times 2} \\ &= \frac{-2 \pm \sqrt{28}}{4} \\ &= \frac{-2 \pm 2\sqrt{7}}{4} \\ &= \frac{-1 \pm \sqrt{7}}{2}\end{aligned}$$

$$(iv) \quad a=3, b=-4, c=-2$$

$$\begin{aligned}x &= \frac{4 \pm \sqrt{4^2 - 4 \times 3 \times -2}}{2 \times 3} \\ &= \frac{4 \pm \sqrt{40}}{6} \\ &= \frac{4 \pm 2\sqrt{10}}{6} \\ &= \frac{2 \pm \sqrt{10}}{3}\end{aligned}$$