

7.5.3 Solutions to 7.4 Homework

Additional Mathematics
A-Level Pure Mathematics : Year 1
Topics in Algebra

Answer 1

(i) $y = (x + 5)^2 - 12$ (ii) $(-5, -12)$ (iii) -12

[3 marks]

Answer 2

(i) $x^2 + 11x + 28$
 $= (x + 7)(x + 4)$

(ii) $x^2 + x - 30$
 $= (x + 6)(x - 5)$

(iii) $3x^2 - 14x + 16$
 $= (3x - 8)(x - 2)$

(iv) $2x^2 + x - 36$
 $= (2x + 9)(x - 4)$

[1, 1, 2, 2 marks]

Answer 3

(i) $y = (x - 6)^2 - 57$ (ii) $(6, -57)$ (iii) 6

[3 marks]

Answer 4

(i) $x^2 + 7x - 8 = 0$
 $(x + 8)(x - 1) = 0$
 $x = -8$ or $x = 1$

(ii) $x^2 - 2x - 35 = 0$
 $(x + 5)(x - 7) = 0$
 $x = -5$ or $x = 7$

(iii) $3x^2 + 17x + 10 = 0$
 $(x + 5)(3x + 2) = 0$
 $x = -5$ or $x = -\frac{2}{3}$

(iv) $5x^2 + 4x - 33 = 0$
 $(x + 3)(5x - 11) = 0$
 $x = -3$ or $x = \frac{11}{5}$

[2, 2, 3, 3 marks]

Answer 5

(i) $y = 4(x + 3)^2 - 25$

[4 marks]

(ii) Parabola with minimum at $(-3, -25)$

[3 marks]

Answer 6

(i) $25^{\frac{3}{2}}$
 $= 125$

(ii) $27^{\frac{2}{3}}$
 $= 9$

(iii) $\left(\frac{3}{2}\right)^{-4}$
 $= \frac{16}{81}$

[1, 1, 1 marks]

Answer 7

$$\begin{aligned} \text{(i)} \quad & \sqrt{45} \\ &= 3\sqrt{5} \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad & \frac{6}{\sqrt{2}} \\ &= 3\sqrt{2} \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad & \frac{\sqrt{108}}{\sqrt{6}} \\ &= 3\sqrt{2} \end{aligned}$$

[1, 1, 1 marks]

Answer 8

$$\begin{aligned} \frac{5 + \sqrt{3}}{3 - \sqrt{3}} &= \frac{5 + \sqrt{3}}{3 - \sqrt{3}} \times \frac{3 + \sqrt{3}}{3 + \sqrt{3}} \\ &= \frac{15 + 8\sqrt{3} + 3}{9 - 3} \\ &= \frac{18 + 8\sqrt{3}}{6} \\ &= \frac{9 + 4\sqrt{3}}{3} \\ &= 3 + \frac{4}{3}\sqrt{3} \end{aligned}$$

[5 marks]

Answer 9

$$\text{(i)} \quad 5x^2 - 40x + 81 \equiv a(x + b)^2 + c$$

$$\begin{aligned} 5x^2 - 40x + 81 &= 5[x^2 - 8x] + 81 \\ &= 5[(x - 4)^2 - 16] + 81 \\ &= 5(x - 4)^2 - 80 + 81 \\ &= 5(x - 4)^2 + 1 \\ \therefore a &= 5, b = -4 \text{ and } c = 1 \end{aligned}$$

[4 marks]

(ii) The minimum value will be 1

[1 mark]

Answer 10

(i) $4x^2 - 12x + 25 \equiv a(x + b)^2 + c$

$$\begin{aligned}4x^2 - 12x + 25 &= 4\left[x^2 - 3x\right] + 25 \\&= 4\left[\left(x - \frac{3}{2}\right)^2 - \frac{9}{4}\right] + 25 \\&= 4\left(x - \frac{3}{2}\right)^2 - 9 + 25 \\&= 4\left(x - \frac{3}{2}\right)^2 + 16 \\&\therefore a = 4, b = -\frac{3}{2} \text{ and } c = 16\end{aligned}$$

[4 marks]

(ii) The minimum value will be 16

[1 mark]