Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

- $\dfrac{\sqrt{3}}{2} \cdot \dfrac{\sqrt{3}}{2} = \mathbf{\dfrac{3}{4}}$

2.2

- $x = \mathbf{60}^\circ,\ \mathbf{240}^\circ$

2.3

- least 1, greatest 5: $\mathbf{1 \le y \le 5}$

2.4

- $1 - \cos^2 x = \sin^2 x$
- $\dfrac{\sin^2 x}{\sin x \cos x} = \dfrac{\sin x}{\cos x} = \tan x$

2.5

- $2x = 30^\circ$ or 150° (in 0°–360°)
- $\mathbf{x = 15}^\circ,\ \mathbf{75}^\circ$

3.1

(a) $a + b = 7$, $a - b = -1$: $\mathbf{a = 3}$, $\mathbf{b = 4}$

(b)

- $3 + 4\cos x = 5 \Rightarrow \cos x = \frac{1}{2}$
- $\mathbf{x} = \frac{\pi}{\mathbf{3}},\ \frac{\mathbf{5\pi}}{\mathbf{3}}$

3.2

(a) $4(1 - \cos^2\theta) + 8\cos\theta - 7 = 0$; rearranged to the given form

(b)

- $(2\cos\theta - 1)(2\cos\theta - 3) = 0$
- $\cos\theta = \frac{1}{2}$; $\cos\theta = \frac{3}{2}$ has no solution
- $\theta = \mathbf{60}^\circ,\ \mathbf{300}^\circ$

3.3

(a) $f(0) = -1$, $f(\pi) = 5$: $\mathbf{-1 \le f(x) \le 5}$

(b) f is **one-one** on $0 \le x \le \pi$ (cos is decreasing there)

(c) $\cos x = \dfrac{2 - y}{3}$; $\mathbf{f^{-1}(x) = \cos^{-1}\left(\dfrac{2 - x}{3}\right)}$

(d) $\cos x = -\frac{1}{2}$; $\mathbf{x} = \frac{\mathbf{2\pi}}{\mathbf{3}}$

(e) stretch, factor 3, parallel to the y-axis; reflection in the x-axis; translation $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$

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