

**Year 2 Pure Chapter 7: R Formula - Exam Questions (Answers)**

1. (a)  $R^2 = (\sqrt{3})^2 + 1^2$  M1

$R = 2$  A1

$\tan \alpha = \sqrt{3}$  M1

$\alpha = \frac{\pi}{3}$  accept awrt 1.05 A1

(b)  $\sin(x + \text{their } \alpha) = \frac{1}{2}$  M1

$x + \text{their } \alpha = \frac{\pi}{6} \left( \frac{5\pi}{6}, \frac{13\pi}{6} \right)$  A1

$x = \frac{\pi}{2}, \frac{11\pi}{6}$  accept awrt 1.57, 5.76 M1 A1

2.

(a)

$$R = \sqrt{5^2 + 3^2};$$

M1

$$= \sqrt{34} \{= 5.83095 \dots\}$$

A1

$$\tan \alpha = \frac{3}{5}$$

M1

$$\alpha = \text{awrt } 0.54 \quad \text{or} \quad \alpha = \text{awrt } 0.17\pi \quad \text{or} \quad \alpha = \frac{\pi}{\text{awrt } 5.8} \quad \text{A1}$$

$$\sqrt{34} \cos(x + 0.5404)$$

$$\text{(b)} \quad \cos(x + 0.5404) = \frac{4}{\sqrt{34}} \{= 0.68599 \dots\} \quad \text{M1}$$

$$(x + 0.5404) = 0.814826916 \dots \quad \text{M1}$$

$$x = \text{awrt } 0.27 \quad \text{A1}$$

$$(x + 0.5404) = 2\pi - 0.814826916 \dots = 5.468358 \dots \quad \text{M1}$$

$$x = \text{awrt } 4.93 \quad \text{A1}$$

$$\text{Hence, } x = \{0.27, 4.93\}$$

3. (a)  $R^2 = 5^2 + 12^2$  M1

$R = 13$  A1

$\tan \alpha = \frac{12}{5}$  M1

$\alpha \approx 1.176$  cao A1

(b)  $\cos(x - 1.176) = \frac{6}{13}$  M1

$(x - 1.176) = 1.091 \dots$  A1

$x = 1.091\dots + 1.176 \dots \approx 2.267\dots$  awrt 2.3 A1

$(x - 1.176) = -1.091 \dots$  M1

$x = -1.091 \dots + 1.176 \dots \approx 0.0849\dots$  awrt 0.084 or 0.085 A1

(c) (i)  $R_{\max} = 13$  B1ft

(ii) At the maximum,

$\cos(x - \alpha) = 1$

or

$x - \alpha = 0$  M1

$x = \alpha = 1.176 \dots$  awrt 1.2, ft their  $\alpha$  A1ft

4. (a)  $R = \sqrt{(12^2 + 4^2)}$  M1

$= \sqrt{160}$  or awrt 12.6 A1

$\tan \alpha = \frac{4}{12}$  M1

$\alpha \approx 18.43^\circ$  or awrt  $18.4^\circ$  A1

(b)  $\cos (x + 18.43) = \frac{7}{\text{their } R}$  M1

$(x + 18.43) = 56.4^\circ$  awrt  $56^\circ$  A1

$(x + 18.43) = 360 - 56.4 = 303.6^\circ$  M1

$x = 38.0, 285.2^\circ$  A1, A1

(c) (i) minimum value is  $-\sqrt{160}$  ft their  $R$  B1ft

(ii)  $\cos (x + 18.43) = -1$  M1

$x \approx 161.57^\circ$  cao A1

5. (a)  $\tan \alpha = 0.75$  M1

$\alpha = 36.9^\circ$  A1

$R^2 = 4^2 + 3^2 = 25 \Rightarrow R = 5$  M1 A1

(b)  $\sin (\theta - 36.9^\circ) = 0.6$  M1

$\theta - 36.9^\circ = 36.9^\circ, 143.1$  A1 M1

$\theta = 73.7^\circ, 180^\circ$  A1 A1

(c) Max value 5 B1

(d)  $\sin (\theta - 36.9^\circ) = 1$  M1

$\theta - 36.9^\circ = 90^\circ$

$\theta = 90^\circ + 36.9^\circ = 126.9^\circ$  A1