

Year 2 Pure Chapter 7: asinx + bcosx- Exam Questions (Answers)

1. (a) $R^2 = (\sqrt{3})^2 + 1^2 \Rightarrow R = 2$ M1A1
 $\tan \alpha = \sqrt{3} \Rightarrow \alpha =$ accept awrt 1.05 M1 A1 4
- (b) $\sin(x + \text{their } \alpha) =$ M1
 $x + \text{their } \alpha =$ A1
 $xi =$ accept awrt 1.57, 5.76 M1 A1 4
2. (a) $5\cos x - 3\sin x = R \cos(x + \alpha), R > 0, 0 < x <$
 $5\cos x - 3\sin x = R\cos x \cos \alpha - R \sin x \sin \alpha$
Equate cos x: $5 = R \cos \alpha$
Equate sin x: $3 = R \sin \alpha$
 $R^2 = 5^2 + 3^2$ M1;
or awrt 5.8 A1
 $\tan \alpha =$ $\tan \alpha =$
 $\sin \alpha =$
 $\cos \alpha =$ M1
 $\alpha = \text{awrt } 0.54 \text{ or } \alpha = \text{awrt } 0.17\pi \text{ or}$
or A1 4
Hence, $5\cos x - 3\sin x =$
- (b) $5\cos x - 3\sin x = 4$
 $\cos(x + 0.5404) =$
 $\cos(x + \text{their } \alpha) =$ M1
 $(x + 0.5404) = 0.814826916...^\circ$ For applying $\cos^{-1}$
M1
 $x = 0.2744...^\circ$ awrt 0.27 $^\circ$ A1
 $(x + 0.5404) = 2\pi - 0.814826916...^\circ$
 $\{ = 5.468358...^\circ \}$ $2\pi - \text{their } 0.8148$ ddM1
 $x = 4.9279...^\circ$ awrt 4.93 $^\circ$ A1 5
Hence, $x = \{0.27, 4.93\}$
3. (a) $R^2 = 5^2 + 12^2$ M1
 $R = 13$ A1
 $\tan \alpha =$ M1
 $\alpha \approx 1.176$ cao A1 4
- (b) $\cos(x - \alpha) =$ M1
 $x - \alpha = \arccos = 1.091 \dots$ A1
 $x = 1.091\dots + 1.176 \dots \approx 2.267\dots$ awrt 2.3 A1
 $x - \alpha = -1.091 \dots$ accept $\dots = 5.19 \dots$ for M M1
 $x = -1.091 \dots + 1.176 \dots \approx 0.0849\dots$ awrt 0.084 or 0.085 A1 5

- (c) (i) $R_{\max} = 13$ ft their R B1ft
(ii) At the maximum, $\cos(x - \alpha) = 1$ or $x - \alpha = 0$ M1
 $x = \alpha = 1.176 \dots$ awrt 1.2, ft their α A1ft 3

[12]

4. (a) $R \cos \alpha = 12$, $R \sin \alpha = 4$
 $R = \sqrt{12^2 + 4^2} = \sqrt{160}$ Accept if just written down, awrt 12.6 M1 A1
 $\tan \alpha = \frac{4}{12} \Rightarrow \alpha \approx 18.43^\circ$ awrt 18.4° M1, A1 4

- (b) $\cos(x + \text{their } \alpha) = (\approx 0.5534)$ M1
 $x + \text{their } \alpha = 56.4^\circ$ awrt 56° A1
 $= \dots, 303.6^\circ$ $360^\circ - \text{their principal value}$ M1
 $x = 38.0, 285.2^\circ$ Ignore solutions out of range A1, A1 5

If answers given to more than 1 dp, penalise first time then accept awrt above.

- (c) (i) minimum value is $-\sqrt{160}$ ft their R B1ft
(ii) $\cos(x + \text{their } \alpha) = -1$ M1
 $x \approx 161.57^\circ$ cao A1 3

[12]

5. (a) $4 \sin \theta - 3 \cos \theta = R \sin \theta \cos \alpha - R \cos \theta \sin \alpha$
 $\sin \theta$ terms give $4 = R \cos \alpha$
 $\cos \theta$ terms give $3 = R \sin \alpha$
 $\tan \alpha = 0.75$ M1
 $\alpha = 36.9^\circ$ A1
 $R^2 = 4^2 + 3^2 = 25 \Rightarrow R = 5$ M1 A1 4

- (b) $5 \sin(\theta - 36.9^\circ) = 3$
 $\sin(\theta - 36.9^\circ) = 0.6$ M1
 $\theta - 36.9^\circ = 36.9^\circ, 143.1^\circ$ A1 M1
 $\theta = 73.7^\circ, 180^\circ$
awrt 74° A1 A15

- (c) Max value 5 B1 1

- (d) $\sin(\theta - 36.9^\circ) = 1$ M1
 $\theta - 36.9^\circ = 90^\circ$

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

A1 2

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