eClassroom

Trigonometric Addition Formulae

Questions

Suitable for:

Pearson Edexcel International A-Level (iAL) — Pure Mathematics 3

Question 1

(a) Using the addition formula for sin(A + B), show that

$$\sin 75° = \frac{\sqrt{6} + \sqrt{2}}{4}$$

(3 marks)

(b) Hence, or otherwise, find the exact value of cos 75°.

(2 marks)

Total for question = 5 marks

Question 2

Using the addition formula for tan(A + B), show that

$$\tan 75° = 2 + \sqrt{3}$$

(4 marks)

Total for question = 4 marks

Question 3

Show that

$$\sin\left(x+\frac{\pi}{3}\right)+\cos\left(x+\frac{\pi}{6}\right)\equiv\sqrt{3}\cos x$$

(4 marks)

Total for question = 4 marks

Question 4

Given that $\sin\theta = 3/5$ and θ is acute, find the exact values of:

(a) $\sin 2\theta$

(2 marks)

(b) $\cos 2\theta$

(2 marks)

(c) $\tan 2\theta$

(1 marks)

Total for question = 5 marks

Question 5

Prove that

$$(\sin x + \cos x)^2 \equiv 1 + \sin 2x$$

(3 marks)

Total for question = 3 marks

Question 6

Prove that

$$\frac{\cos 2x}{1+\sin 2x} \equiv \frac{\cos x - \sin x}{\cos x + \sin x}$$

(4 marks)

Total for question = 4 marks

Question 7

Solve, for $0° \leq x \leq 360°$,

$$3\cos 2x - \cos x = 2$$

giving any non-exact answers to 2 decimal places.

(6 marks)

Total for question = 6 marks

Question 8

Solve, for $0 \leq x \leq 2\pi$,

$$\sin 2x = \sin x$$

giving your answers as exact multiples of π.

(5 marks)

Total for question = 5 marks

Question 9

Express $3\sin x + 4\cos x$ in the form $R\sin(x + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$.

Find the values of R and α, giving α to 2 decimal places.

(4 marks)

Total for question = 4 marks

Question 10

Using your answer to Question 9, solve, for $0° \leq x \leq 360°$,

$$3\sin x + 4\cos x = 3$$

giving your answers to 2 decimal places.

(4 marks)

Total for question = 4 marks

Question 11

Express $5\cos x - 12\sin x$ in the form $R\cos(x + \alpha)$, where $R > 0$ and $0° < \alpha < 90°$.

(a) Find the values of R and α, giving α to 2 decimal places.

(4 marks)

(b) Hence state the maximum and minimum values of $5\cos x - 12\sin x$.

(2 marks)

(c) Find the smallest positive value of x for which the maximum occurs.

(2 marks)

Total for question = 8 marks

Question 12

Prove that

$$\sin(x + y) + \sin(x - y) \equiv 2\sin x\cos y$$

(3 marks)

Total for question = 3 marks

Question 13

Prove that

$$\cos 3x \equiv 4\cos^3 x - 3\cos x$$

(5 marks)

Total for question = 5 marks