

Addition & Double Angle Formulae

Difficulty: Medium

Question Paper 1

Level	A Level
Subject	Maths Pure 3
Exam Board	CIE
Topic	Trigonometry
Sub-Topic	Addition & double angle formulae
Difficulty	Medium
Booklet	Question Paper 1

Time allowed: 50 minutes

Score: /36

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E
>90%	81%	70%	58%	46%	34%

Question 1

The angles θ and ϕ lie between 0° and 180° , and are such that

$$\tan(\theta - \phi) = 3 \quad \text{and} \quad \tan \theta + \tan \phi = 1.$$

Find the possible values of θ and ϕ .

[6]

Question 2

(i) Prove the identity

$$\cos 4\theta + 4 \cos 2\theta \equiv 8 \cos^4 \theta - 3.$$

[4]

(ii) Hence solve the equation

$$\cos 4\theta + 4 \cos 2\theta = 2,$$

for $0^\circ \leq \theta \leq 360^\circ$.

[4]

Question 3

It is given that $\cos a = \frac{3}{5}$, where $0^\circ < a < 90^\circ$. Showing your working and without using a calculator to evaluate a ,

(i) find the exact value of $\sin(a - 30^\circ)$, [3]

(ii) find the exact value of $\tan 2a$, and hence find the exact value of $\tan 3a$. [4]

Question 4

(i) Prove the identity $\cos 3\theta \equiv 4 \cos^3 \theta - 3 \cos \theta$. [4]

(ii) Using this result, find the exact value of

$$\int_{\frac{1}{3}\pi}^{\frac{1}{2}\pi} \cos^3 \theta \, d\theta. \quad [4]$$

Question 5

(i) Show that the equation

$$\tan(60^\circ + \theta) + \tan(60^\circ - \theta) = k$$

can be written in the form

$$(2\sqrt{3})(1 + \tan^2 \theta) = k(1 - 3 \tan^2 \theta). \quad [4]$$

(ii) Hence solve the equation

$$\tan(60^\circ + \theta) + \tan(60^\circ - \theta) = 3\sqrt{3},$$

giving all solutions in the interval $0^\circ \leq \theta \leq 180^\circ$. [3]