

Addition & Double Angle formulae

Difficulty: Medium

Question Paper 2

Level	A Level only
Subject	Maths - Pure
Exam Board	Edexcel
Topic	Trigonometry & Modelling
Sub-Topic	Addition & Double Angle Formulae
Difficulty	Medium
Booklet	Question Paper 2

Time allowed: 50 minutes

Score: /42

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>76%	61%	52%	42%	33%	23%	<23%

Question 1

(a) Show that

$$\operatorname{cosec} 2x + \cot 2x = \cot x, \quad x \neq 90n^\circ, \quad n \in \mathbb{Z} \quad (5)$$

(b) Hence, or otherwise, solve, for $0 \leq \theta < 180^\circ$,

$$\operatorname{cosec}(4\theta + 10^\circ) + \cot(4\theta + 10^\circ) = \sqrt{3}$$

You must show your working.

(Solutions based entirely on graphical or numerical methods are not acceptable.) (5)

(Total 10 marks)

Question 2

(a) Starting from the formulae for $\sin(A+B)$ and $\cos(A+B)$, prove that

$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B} \quad (4)$$

(b) Deduce that

$$\tan\left(\theta + \frac{\pi}{6}\right) = \frac{1 + \sqrt{3} \tan \theta}{\sqrt{3} - \tan \theta} \quad (3)$$

(c) Hence, or otherwise, solve, for $0 \leq \theta \leq \pi$,

$$1 + \sqrt{3} \tan \theta = (\sqrt{3} - \tan \theta) \tan(\pi - \theta)$$

Give your answers as multiples of π . (6)

(Total 13 marks)

Question 3

Given that

$$2\cos(x + 50)^\circ = \sin(x + 40)^\circ$$

(a) Show, without using a calculator, that

$$\tan x^\circ = \frac{1}{3} \tan 40^\circ \quad (4)$$

(b) Hence solve, for $0 \leq \theta < 360$,

$$2\cos(2\theta + 50)^\circ = \sin(2\theta + 40)^\circ$$

giving your answers to 1 decimal place. (4)

(Total 8 marks)

Question 4

(a) Use the double angle formulae and the identity

$$\cos(A + B) \equiv \cos A \cos B - \sin A \sin B$$

to obtain an expression for $\cos 3x$ in terms of powers of $\cos x$ only. (4)

(b) (i) Prove that

$$\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x} \equiv 2 \sec x, \quad x \neq (2n + 1) \frac{\pi}{2}. \quad (4)$$

(ii) Hence find, for $0 < x < 2\pi$, all the solutions of

$$\frac{\cos x}{1 + \sin x} + \frac{1 + \sin x}{\cos x} = 4. \quad (3)$$

(Total 11 marks)