Trigonometry
Difficulty: Hard

Question Paper 1

Level	A Level
Subject	Maths Pure 3
Exam Board	CIE
Topic	Trigonometry
Difficulty	Hard
Booklet	Question Paper 1

Time allowed: **67 minutes**

Score: **/48**

Percentage: **/100**

Grade Boundaries:

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

(i) Show that the equation

$$\tan(x - 60^\circ) + \cot x = \sqrt{3}$$

can be written in the form

$$2\tan^2 x + (\sqrt{3})\tan x - 1 = 0.$$ [3]

(ii) Hence solve the equation

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

for $0^\circ < x < 180^\circ$. [3]

Question 2

Solve the equation $\cot 2x + \cot x = 3$ for $0° < x < 180°$.

[6]

Question 3

Express the equation $\cot 2\theta = 1 + \tan\theta$ as a quadratic equation in $\tan\theta$. Hence solve this equation for $0° < \theta < 180°$. [6]

(i) Prove the identity $\tan(45^\circ + x) + \tan(45^\circ - x) \equiv 2\sec 2x$. [4]

(ii) Hence sketch the graph of $y = \tan(45^\circ + x) + \tan(45^\circ - x)$ for $0^\circ \leq x \leq 90^\circ$. [3]

Question 5

By expressing the equation $\tan(\theta + 60^\circ) + \tan(\theta - 60^\circ) = \cot\theta$ in terms of $\tan\theta$ only, solve the equation for $0^\circ < \theta < 90^\circ$. [5]

(i) Show that the equation $(\sqrt{2})\operatorname{cosec} x + \cot x = \sqrt{3}$ can be expressed in the form $R\sin(x - \alpha) = \sqrt{2}$, where $R > 0$ and $0° < \alpha < 90°$. [4]

(ii) Hence solve the equation $(\sqrt{2})\operatorname{cosec} x + \cot x = \sqrt{3}$, for $0° < x < 180°$. [4]

(i) Given that $\sec\theta + 2\operatorname{cosec}\theta = 3\operatorname{cosec}2\theta$, show that $2\sin\theta + 4\cos\theta = 3$. [3]

(ii) Express $2\sin\theta + 4\cos\theta$ in the form $R\sin(\theta + \alpha)$ where $R > 0$ and $0° < \alpha < 90°$, giving the value of α correct to 2 decimal places. [3]

(iii) Hence solve the equation $\sec\theta + 2\operatorname{cosec}\theta = 3\operatorname{cosec}2\theta$ for $0° < \theta < 360°$. [4]