3.1 Reciprocal Trigonometric Functions

Question Paper

Course	CIE A Level Maths
Section	3. Trigonometry
Topic	3.1 Reciprocal Trigonometric Functions
Difficulty	Hard

Time allowed: 40

Score: /28

Percentage: /100

Question 1a

(a) Rewrite $\tan\theta \operatorname{cosec}\theta$ as a single trigonometric function.

[2 marks]

Question 1b

(b) Hence solve, in the range $-\pi < \theta \leq \pi$, the equation

$$\tan\theta \operatorname{cosec}\theta = -\frac{2\sqrt{3}}{3}.$$

[3 marks]

Question 2

Solve, in the range $0 \leq \theta \leq 2\pi$, the equation

$$\frac{2}{\operatorname{cosec}\theta} - \operatorname{cosec}\theta = 1.$$

[6 marks]

Question 3

Using the double angle formula $\sin 2A \equiv 2 \sin A \cos A$, find the solutions to the equation

$$\sec x \operatorname{cosec} x - 75 = 5 \operatorname{cosec} 2x$$

in the range $-\pi < x \leq \pi$. Give your answers correct to 3 significant figures.

[6 marks]

Question 4a

(a) Show that the equation

$$2\cot^2 x = 1 - 5\operatorname{cosec} x$$

can be rewritten in the form

$$(2\operatorname{cosec} x - 1)(\operatorname{cosec} x + 3) = 0.$$

[3 marks]

Question 4b

(b) Hence solve, in the range $0 \leq x \leq 2\pi$, the equation

$$2\cot^2 x = 1 - 5\operatorname{cosec} x$$

giving your answers correct to 3 significant figures.

[3 marks]

Question 5

(i) Sketch, in the interval $-2\pi \leq \theta \leq 2\pi$, the graph of $y = -5 + \frac{1}{2}\sec\theta$, include asymptotes and label the coordinates of all maximum and minimum points.

(ii) Hence deduce the range of values for k for which the equation $-5 + \frac{1}{2}\sec\theta = k$ has no solutions.

[5 marks]