

Integration – Trig, Log & Exponential Functions

Question Paper 2

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Integration
Sub Topic	Integration – Trig, Log & Exponential Functions
Booklet	Question Paper 2

Time Allowed: 58 minutes

Score: /48

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 (i) Prove that $\tan \theta + \cot \theta \equiv \frac{2}{\sin 2\theta}$. [3]

(ii) Hence

(a) find the exact value of $\tan \frac{1}{8}\pi + \cot \frac{1}{8}\pi$, [2]

(b) evaluate $\int_0^{\frac{1}{2}\pi} \frac{6}{\tan \theta + \cot \theta} d\theta$. [3]

2 (i) Find $\int \frac{2}{4x-1} dx$. [2]

(ii) Hence find $\int_1^7 \frac{2}{4x-1} dx$, expressing your answer in the form $\ln a$, where a is an integer. [3]

3 (a) Find

(i) $\int \frac{e^{2x} + 6}{e^{2x}} dx$, [3]

(ii) $\int 3 \cos^2 x dx$. [3]

(b) Use the trapezium rule with 2 intervals to estimate the value of

$$\int_1^2 \frac{6}{\ln(x+2)} dx,$$

giving your answer correct to 2 decimal places. [3]

4 (i) Show that $12 \sin^2 x \cos^2 x \equiv \frac{3}{2}(1 - \cos 4x)$. [3]

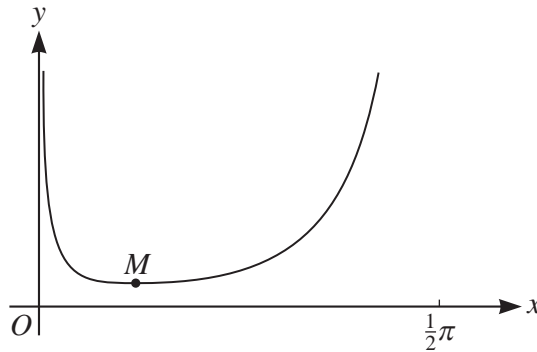
(ii) Hence show that

$$\int_{\frac{1}{4}\pi}^{\frac{1}{3}\pi} 12 \sin^2 x \cos^2 x dx = \frac{\pi}{8} + \frac{3\sqrt{3}}{16}. [3]$$

- 5 A curve is such that $\frac{dy}{dx} = \frac{4}{7-2x}$. The point (3, 2) lies on the curve. Find the equation of the curve. [4]

- 6 (a) Find the exact area of the region bounded by the curve $y = 1 + e^{2x-1}$, the x -axis and the lines $x = \frac{1}{2}$ and $x = 2$. [4]

(b)



The diagram shows the curve $y = \frac{e^{2x}}{\sin 2x}$ for $0 < x < \frac{1}{2}\pi$, and its minimum point M . Find the exact x -coordinate of M . [5]

- 7 (a) Find $\int 4e^{-\frac{1}{2}x} dx$. [2]

- (b) Show that $\int_1^3 \frac{6}{3x-1} dx = \ln 16$. [5]