

SECTION I

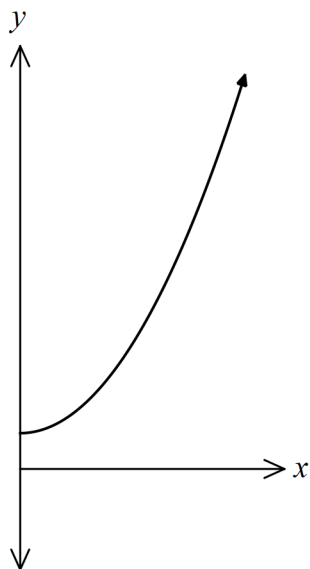
Multiple Choice.

(Each question in this section is worth 1 mark)

Use multiple choice answer sheet for Questions 1 – 5.

- 1 The function $y = 3 \cos 2x - 4$ has
- (A) amplitude 2, period $\frac{2\pi}{3}$ and centre -4
 - (B) amplitude 3, period π and centre -4
 - (C) amplitude $\frac{1}{3}$, period π and centre -4
 - (D) amplitude 3, period π and centre 4
- 2 Given $y = (3 + e^x)^4$, which of the following is the correct derivative, $\frac{dy}{dx}$?
- (A) $\frac{dy}{dx} = 4(3 + e^x)^3$
 - (B) $\frac{dy}{dx} = 4e^x(3 + e^x)$
 - (C) $\frac{dy}{dx} = 4e^{3x}$
 - (D) $\frac{dy}{dx} = 4e^x(3 + e^x)^3$
- 3 The area of a rectangle with sides x and y is 36. Which of the following gives its perimeter, P ?
- (A) $P = x + 36x^2$
 - (B) $P = x + \frac{36}{x}$
 - (C) $P = 2x + \frac{72}{x}$
 - (D) $P = 2x + \frac{36}{x}$

- 4 For the curve shown below, which inequalities are correct?



- (A) $\frac{dy}{dx} > 0$, $\frac{d^2y}{dx^2} > 0$
- (B) $\frac{dy}{dx} > 0$, $\frac{d^2y}{dx^2} < 0$
- (C) $\frac{dy}{dx} < 0$, $\frac{d^2y}{dx^2} > 0$
- (D) $\frac{dy}{dx} < 0$, $\frac{d^2y}{dx^2} < 0$
- 5 Which of the following is the correct exact value for $\int_1^3 \frac{dx}{x}$?

- (A) $\ln 2$
- (B) $\ln 3$
- (C) 1.099
- (D) $\frac{1}{3}$

SECTION II

Name.....

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For Questions 6-14, your responses should include relevant mathematical reasoning and/or calculations.

PART A (9 marks)

Marks

Question 6

Differentiate the following:

(a) $y = 4 \tan 3x$

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(b) $y = x^2 \ln x$

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(c) $y = \log_3(2x+1)$

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Question 7

Explain why $y = -3x + 4$ is decreasing for all real values of x .

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Question 8

Solve $\cos(x + 0.2) = -0.3$ for $[0, \pi]$, giving solutions to 3 decimal places.

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SECTION II

Name.....

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PART B (9 marks)

Marks

Question 9

- (a) Show that if $y = x(x-2)^2$, then $y' = (x-2)(3x-2)$. 2

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- (b) Find any stationary points and determine their nature. 3

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Question 10

A surveyor measures the width of a garden area at regular increments, and records the data in a table (shown below).

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Use the trapezoidal rule at each of the 5 widths, to approximate the surface area of the garden.

x_k	0	5	10	15	20
y_k	24	33	46	28	37

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Question 11

Evaluate the integral $\int_2^3 \frac{5x^2 + 8x^4}{x^4} dx$.

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SECTION II

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PART C (9 marks)

Marks

Question 12

The height h and radius r of a cylinder have a sum of 36 cm.

- (a) Show that the volume of the cylinder is

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$$V = 36\pi r^2 - \pi r^3.$$

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- (b) Find the maximum volume of the cylinder, in exact form.

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Question 13

Find the area enclosed between $y = x^2 + 2x$, and the x -axis.

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Question 14

Find $\int \sec^2 x (1 - \tan x)^2 dx$

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End of Assessment