UNIVERSITI KUALA LUMPUR

MALAYSIA INSTITUTE OF CHEMICAL AND BIOENGINEERING TECHNOLOGY

FINAL EXAMINATION

OCTOBER 2025 SEMESTER

COURSE CODE	:	CLB12103
COURSE NAME	:	MATHEMATICS 1
PROGRAMME NAME	:	TECHNICAL FOUNDATION
DATE	:	24 JANUARY 2026
TIME	:	2.00 PM – 5.00 PM
DURATION	:	3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please CAREFULLY read the instructions given in the question paper.
2. This question paper consists of FIVE (5) questions. Answer ONLY FOUR (4) questions.
3. Write your answers in the answer booklet provided.
4. Answer all questions in English language ONLY.
5. Formula table has been appended for your reference.

THERE ARE 4 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

(Total: 100 marks)

INSTRUCTIONS: Answer Four Questions Only.

Please use the answer booklet provided.

Question 1

(a) Simplify the following expressions.

i. $(2np^{-2})^{-2}(4^{-1}p^2)^{-1}$

(4 marks)

ii. $ab\left(\frac{a^{-2}}{b^{-2}}\right)^{-3}\left(\frac{a^{-3}}{b^5}\right)^2$

(4 marks)

iii. $\left(\frac{V^{-1}}{2t}\right)^{-2}\left(\frac{t^2}{V^{-2}}\right)^{-3}$

(4 marks)

(b) Simplify the following expressions using the laws of logarithm.

i. $4\,log\sqrt{x} + 2\log\left(\frac{1}{x}\right)$

(4 marks)

ii. $\log A - \frac{1}{2}\log 4A$

(4 marks)

iii. $\log xy + 2\log\left(\frac{x}{y}\right) + 3\log\left(\frac{y}{x}\right)$

(5 marks)

Question 2

(a) Differentiate the following functions using the product rule.

i. $f(z) = (z^6 + 4)(z^7 - 2)$

(4 marks)

ii. $y = \cos(x^2 - 2)\, e^{2x^2}$

(4 marks)

(b) Differentiate the following functions using the quotient rule.

i. $f(x) = \frac{x^3+6x}{x^2-x}$

(4 marks)

ii. $y = \frac{\sin(x^2+2)}{e^{2x-2}}$

(4 marks)

(c) Given $f(x) = 2x^3 - 3x^2 - 36x + 4$

i. Determine $f'(x)$.

(1 mark)

ii. Determine the stationary points (x, y).

(4 marks)

iii. Determine if the stationary points are maximum or minimum points.

(4 marks)

Question 3

(a) The distance s meters moved by car in a time t seconds is given by $s = 3t^3 - 2t^2 + 4t - 1$. Determine the velocity and acceleration when:

i. $t = 0$ s

(3 marks)

ii. $t = 1.5$ s

(3 marks)

(b) A 5 m long ladder rests against a vertical wall and is sliding down the wall at the rate of 0.5 m/s when the foot of the ladder is 3 m from the base of the wall. At this instant, how fast is the foot of the ladder moving away from the wall?

(6 marks)

(c) Determine the area of the largest piece of rectangular land that can be enclosed by $100\ m$ of fencing, if part of an existing straight wall is used as one side and won't need any fencing.

(8 marks)

(d) Solve the following:

i. $\int -\frac{2}{5}\ dx$

(2 marks)

ii. $\int \frac{1}{(2x-5)^4}\ dx$

(3 marks)

Question 4

(a) Determine the following integrals:

i. $\int \sec x^3 \tan x^3 - \csc^2(5x)\ dx$

(3 marks)

ii. $\int e^{5w+2}(e^{-w}) - 2w^5\ dw$

(3 marks)

iii. $\int 5(10-1)^{-1}\ dx$

(3 marks)

(b) Solve the integration using substitution method or integration by parts method.

i. $\int \sin(2x)\cos^4(2x)\ dx$

(5 marks)

ii. $\int x^2 \ln(x)\ dx$

(6 marks)

(c) Solve the determinate integral

$$\int_1^2 \left[\frac{1}{2u^2} - \frac{3}{2u^3} + \frac{9}{2u^4}\right] du$$

(5 marks)

Question 5

(a) Write the correct partial fraction decomposition form for the given functions below. Do not solve the variables.

i. $\int \frac{5x-4}{2x^2+x-1} dx$

(4 marks)

ii. $\int \frac{2x+4}{x^3-2x^2} dx$

(4 marks)

(b) Determine the integrations using the integration by partial fraction method (CASE 1 or CASE 2).

iii. $\int \frac{10x-2}{2x^2+x-1} dx$

(7 marks)

iv. $\int \frac{x+2}{x^3-2x^2} dx$

(10 marks)

END OF EXAMINATION PAPER

Differentiation Formula		
$\frac{d}{dx}(uv) = vu' + uv'$	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{u'v - uv'}{v^2}$	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
$\frac{d}{dx}(x^n) = nx^{n-1}$	$\frac{d}{dx}(e^{ax}) = ae^x$	$\frac{d}{dx}(\ln x) = \frac{1}{x}$
$\frac{d}{dx}(\sin ax) = a\cos ax$	$\frac{d}{dx}(\csc ax)$ $= -a \csc ax \cot ax$	$\frac{d}{dx}(\tan ax) = a\sec^2 ax$
$\frac{d}{dx}(\cos ax) = -a\sin ax$	$\frac{d}{dx}(\sec ax) = a \sec ax \tan ax$	$\frac{d}{dx}(\cot ax) = -a \csc^2 ax$
Integration Formula		
$\int x^n \, dx = \frac{x^{n+1}}{n+1} + C$	$\int \sin(ax) \, dx = \frac{-\cos(ax)}{a} + C$	$\int \cos(ax) \, dx = \frac{\sin(ax)}{a} + C$
$\int \tan(ax) \, dx = \frac{\sec^2(ax)}{a} + C$	$\int e^{ax} \, dx = \frac{e^{ax}}{a} + C$	$\int u \, dv = uv - \int v \, du$