UNIVERSITI KUALA LUMPUR
MATHEMATICS CENTRAL COMMITTEE

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE	:	**WQD10203**
COURSE NAME	:	**TECHNICAL MATHEMATICS 2**
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	:	**DIPLOMA OF ENGINEERING TECHNOLOGY (NAVAL ARCHITECTURE AND SHIPBUILDING)** **DIPLOMA OF ENGINEERING TECHNOLOGY IN SHIP CONSTRUCTION AND MAINTENANCE**
DATE	:	**27 JANUARY 2026**
TIME	:	**9:00 AM – 11:30 AM**
DURATION	:	**2 HOURS AND 30 MINUTES**

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2)** sections.
4. Answer **ALL** questions in Section A and **TWO (2)** questions in Section B.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language **ONLY**.
7. Formula sheet is appended for your reference.

THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THESE COVER PAGES.

SECTION A (Total: 60 marks)

Instructions: Answer ALL questions.
Please use the answer booklet provided.

Question 1

Given that $f(x) = 11x^2 + 7$ and $g(x) = x - 1$, determine:

(a) $f(3) + g(3)$.

(2 marks)

(b) $(g \circ f)(x)$.

(4 marks)

(c) $f^{-1}(x)$.

(4 marks)

Question 2

(a) Determine the limits for the following functions:

i. $\lim_{x \to 1} \frac{2}{x+1}$.

(2 marks)

ii. $\lim_{x \to 2} \frac{x^2 - 2x}{x - 2}$

(3 marks)

(b) Figure 1 shows graph of piecewise function,

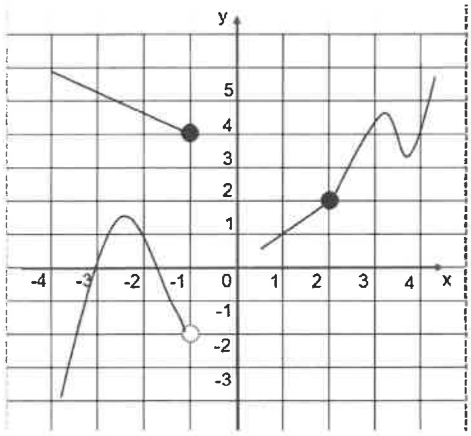

Figure 1

Determine the following limits:

i. $\lim_{x \to 2^-} f(x)$

(1 mark)

ii. $\lim_{x \to 2^+} f(x)$

(1 mark)

iii. $\lim_{x \to 2} f(x)$

(1 mark)

(c) Given that the function is defined by the graphs in Figure 2, determine if $f(x)$ is continuous at $x = 2$. Give your reason.

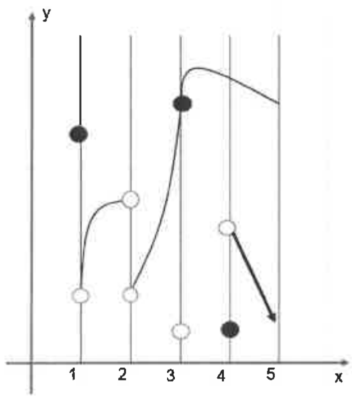

Figure 2

(2 marks)

Question 3

Differentiate the following functions:

(a) $f(x) = 2x^3 + 5x + 6$

(2 marks)

(b) $f(x) = 3(x^4 - 5)^{-4}$

(3 marks)

(c) $f(x) = \dfrac{x^2 + 4x}{\sqrt{x}}$

(5 marks)

Question 4

Differentiate the following functions:

(a) $f(x) = \ln(3x + 1)$

(2 marks)

(b) $f(x) = \cos(x^2 + 4)$

(3 marks)

(c) $f(x) = 3xe^{2x}$

(5 marks)

Question 5

Integrate the following functions:

(a) $\int \frac{4}{5}x \, dx$

(2 marks)

(b) $\int \sqrt[2]{x^3} \, dx$

(4 marks)

(c) $\int \left(x^4 - \frac{1}{x^2} \right) dx$

(4 marks)

Question 6

(a) Integrate $\int x\left(x^2+4\right)^5 dx$ by using substitution method.

(5 marks)

(b) Evaluate the definite integral, $\int_{-2}^{0} \left(2x^2+7x-3\right) dx$.

(5 marks)

SECTION B (Total: 40 marks)

Instructions: Answer TWO (2) questions only.
Please use the answer booklet provided.

Question 1

(a) Given the function $y = \dfrac{\left(x^4 + 2\right)^3}{\left(x^3 + x^2\right)}$.

i. State the rule to find $\dfrac{dy}{dx}$.

(1 mark)

ii. Differentiate the function based on answer in part (a) i.

(7 marks)

iii. Hence, evaluate $\dfrac{dy}{dx}$ at $x = 1$.

(2 marks)

(b) Given $\dfrac{x+7}{x^2 - x - 6} = \dfrac{A}{x-3} + \dfrac{B}{x+2}$.

i. Determine the values of *A* and *B*.

(6 marks)

ii. Hence, solve $\int \dfrac{x+7}{x^2 - x - 6}\, dx$ by using partial fraction method.

(4 marks)

Question 2

(a) By using implicit differentiation, determine the slope of the curve at point $(2,1)$ for

$$4x^2 - 6y^3 + xy^2 - 7 = 0$$

(10 marks)

(b) Refer to the Figure 3, a region is bounded by a curve $y = 2x - x^2$ and the line $y = x$.

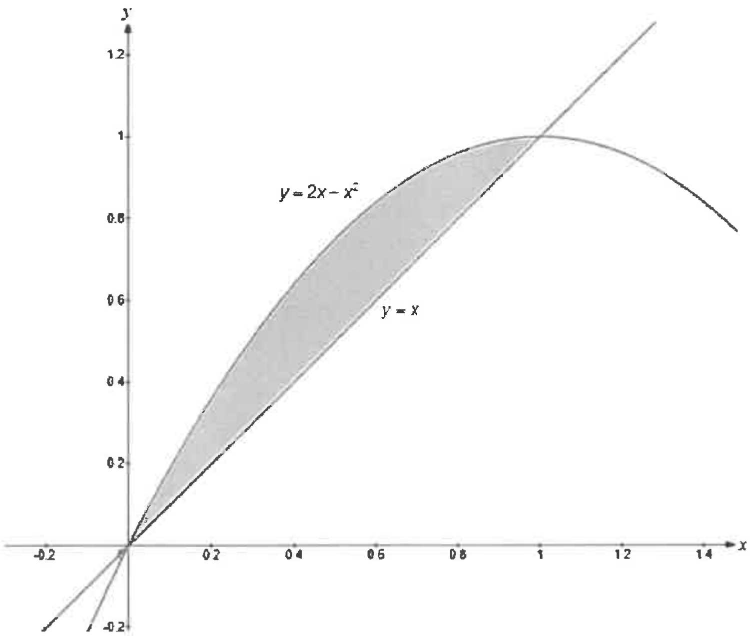

Figure 3

Determine:

i. the value of x-intersect between the curve and the line.

(3 marks)

ii. the area of the bounded region.

(7 marks)

Question 3

(a) An experimental rocket is launched vertically and reaches the height, $h(t) = 160t - 16t^2$ after t seconds. Determine:

i. the height, $h(t)$ of the rocket after 1 second.

(3 marks)

ii. the initial velocity, v of the rocket given that $v = \frac{dh}{dt}$ at $t = 0$.

(4 marks)

iii. the velocity, v of the rocket after 2 seconds.

(3 marks)

(b) Figure 4 shows a solid formed by revolving the curves, $y = x^2 + 1$ and $y = -x + 3$ about the x-axis.

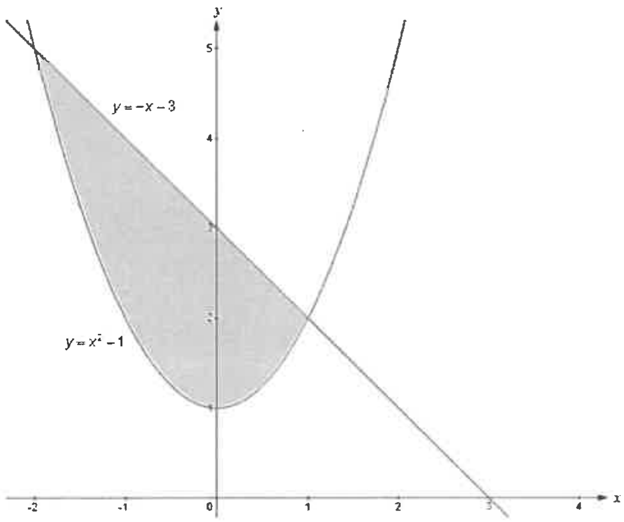

Figure 4

Determine:

i. the value of x-intersect between the curve and the line.

(3 marks)

ii. the volume of the solid formed.

(7 marks)

END OF EXAMINATION PAPER

FORMULA SHEET

DIFFERENTIATION

TRIGONOMETRIC FUNCTION	
$\frac{d}{dx}(\sin f(x)) = [\cos f(x)] \cdot f'(x)$	$\frac{d}{dx}(\csc f(x)) = [-\csc f(x)\ \cot f(x)] \cdot f'(x)$
$\frac{d}{dx}(\cos f(x)) = [-\sin f(x)] \cdot f'(x)$	$\frac{d}{dx}(\sec f(x)) = [\sec f(x)\ \tan f(x)] \cdot f'(x)$
$\frac{d}{dx}(\tan f(x)) = [\sec^2 f(x)] \cdot f'(x)$	$\frac{d}{dx}(\cot f(x)) = [-\csc^2 f(x)] \cdot f'(x)$

EXPONENTIAL FUNCTION	LOGARITHMIC FUNCTION
$\frac{d}{dx} e^{f(x)} = [e^{f(x)}] \cdot f'(x)$	$\frac{d}{dx} \ln f(x) = \left[\frac{1}{f(x)}\right] \cdot f'(x)$

INTEGRATION

TRIGONOMETRIC FUNCTION Where : $f(x) = ax + b$	
$\int \cos f(x) dx = \frac{\sin f(x)}{f'(x)} + c$	$\int \sec f(x) \tan f(x) dx = \frac{\sec f(x)}{f'(x)} + c$
$\int \sin f(x) dx = \frac{-\cos f(x)}{f'(x)} + c$	$\int \csc f(x) \cot f(x) dx = \frac{-\csc f(x)}{f'(x)} + c$
$\int \sec^2 f(x) dx = \frac{\tan f(x)}{f'(x)} + c$	$\int \csc^2 f(x) dx = \frac{-\cot f(x)}{f'(x)} + c$

EXPONENTIAL FUNCTION Where : $f(x) = ax + b$	RECIPROCAL FUNCTION Where : $f(x) = ax + b$
$\int e^{f(x)} dx = \frac{e^{f(x)}}{f'(x)} + c$	$\int \frac{1}{f(x)} dx = \frac{\ln\lvert f(x)\rvert}{f'(x)} + c$

FORMULA SHEET

INTEGRATION

DEFINITE INTEGRAL
$\int_a^b f(x)\,dx = [F(x)]_a^b = F(b) - F(a)$

INTEGRATION BY PART
$\int u\,dv = uv - \int v\,du$

AREA UNDER CURVE	AREA BETWEEN CURVES
$A = \int_a^b f(x)\,dx$	$A = \int_a^b f(x) - g(x)\,dx$

VOLUME (SOLIDS OF REVOLUTION)	VOLUME OF TWO CURVES
$V = \pi\int_a^b [f(x)]^2\,dx$	$V = \pi\int_a^b [f(x)]^2 - [g(x)]^2\,dx$