CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
MATHEMATICS CENTRAL COMMITTEE

FINAL EXAMINATION
MARCH 2026 SEMESTER

COURSE CODE	: WQD10203
COURSE NAME	: TECHNICAL MATHEMATICS 2
PROGRAMME NAME (FOR MPU: PROGRAMME LEVEL)	: DIPLOMA OF ENGINEERING TECHNOLOGY
DATE	: 24 JUNE 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 $f(t)=t^2+1$ and $g(t)=3t-2$. Determine:

(a) $f(3)+g(-1)$

(3 marks)

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

(3 marks)

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

(4 marks)

Question 2

(a) Evaluate the following limits:

i. $\lim_{x \to 3} \left(2x^2 - 5\right)$

(2 marks)

ii. $\lim_{x \to 1} \frac{(x-1)(x-2)}{x^2 - 1}$

(3 marks)

(b) By referring to Figure 1 below:

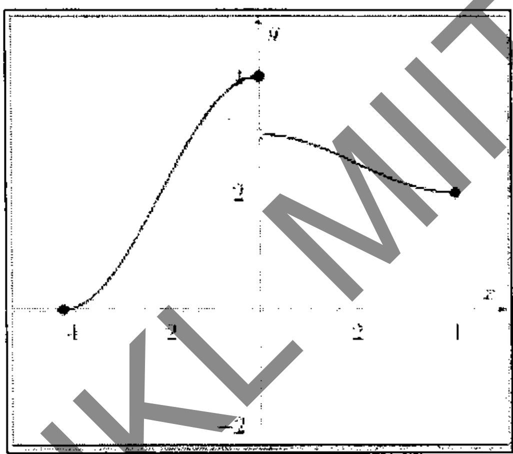

Figure 1

Determine:

i. $\lim_{x \to 0^-} f(x)$

(1 mark)

ii. $\lim_{x \to 0^-} f(x)$

(1 mark)

iii. $\lim_{x \to 0} f(x)$

(1 mark)

iv. whether $f(x)$ is continuous at $x = 0$. Give the reason.

(2 marks)

Question 3

Given $f(x) = 7x^3 + 4e^{2x}$, $g(x) = 3\cos(5x) + 2\sin(9x)$ and $h(x) = \left[\ln(5x-3)\right]^4$. Calculate:

(a) $f'(1)$.

(3 marks)

(b) $g'(0)$.

(4 marks)

(c) $h'(x)$

(3 marks)

Question 4

Differentiate the following:

(a) $y = 5x^3\cos(2x)$ by using product rule.

(4 marks)

(b) $f(x) = \dfrac{3x-8}{e^{4x}}$ by using quotient rule.

(6 marks)

Question 5

Given $\int_{-1}^{3} f(x)dx = 6$ and $\int_{3}^{4} f(x)dx = 5$. Solve the following:

(a) $\int_{-1}^{4} f(x)dx$.

(3 marks)

(b) $\int_{-1}^{3} 2f(x)dx + \int_{3}^{4} 7f(x)dx$.

(3 marks)

(c) $\int_{3}^{-1} 2f(x)dx + \int_{4}^{3} 5f(x)dx$

(4 marks)

Question 6

Determine the following:

(a) $\int \left(\frac{3}{4}e^{2x} + \frac{1}{x-7}\right)dx$.

(3 marks)

(b) $\int \left(\csc^2 x + \sin 8x\right)dx$.

(2 marks)

(c) $\int_{1}^{2} \frac{5x^3 - 1}{x^2}\,dx$.

(5 marks)

SECTION B (Total: 40 marks)

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

Question 1

(a) The equation of a curve is given by $3x^2 - y^3 + x^2y^2 - 4 = 0$.

i. Determine the slope of the curve, $\frac{dy}{dx}$ using implicit differentiation.

(8 marks)

ii. Hence, calculate the value of $\frac{dy}{dx}$ at point $(-2,1)$.

(2 marks)

(b) Figure 2 shows a region bounded by the lines $y = 2x$ and $y = 5x - x^2$.

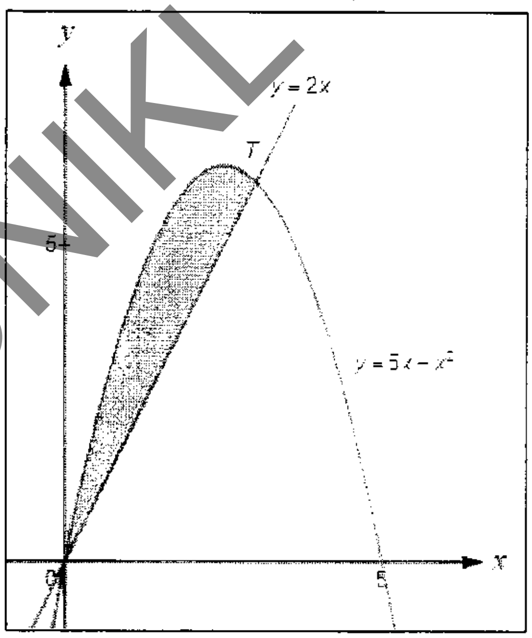

Figure 2

i. Determine the x-coordinate of point T.

(4 marks)

ii. Calculate the area of the shaded region.

(6 marks)

Question 2

(a) Figure 3 shows an equilateral triangle with side x *cm*. Given the area of the triangle, $A = \frac{\sqrt{3}}{2}x^2$ and the side, x change at the rate of $0.1\ cm/s$. Calculate the rate of change for the area when the area is $100\,cm^2$.

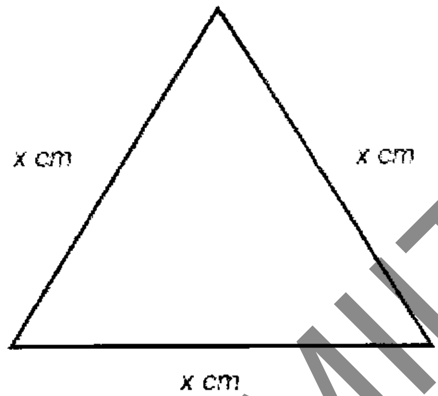

Figure 3

(10 marks)

(b) Given $\frac{3x+11}{x^2-x-6} = \frac{A}{x-3} + \frac{B}{x+2}$.

i. Determine the value of A and B.

(6 marks)

ii. Hence, evaluate $\int \frac{3x+11}{x^2-x-6}\,dx$ by using partial fraction method.

(4 marks)

Question 3

(a) Ahmad is pumping an air-pump ball at the rate of $5\,cm^3/\text{sec}$. Calculate the rate of change of radius when the diameter of the ball, d is $8\,cm$.

[Hint: Volume of sphere, $V = \frac{4}{3}\pi r^3$]

(10 marks)

(b) A region is bounded by lines $y = x$ and $y = \frac{1}{2}x^2$ as shown in Figure 4.

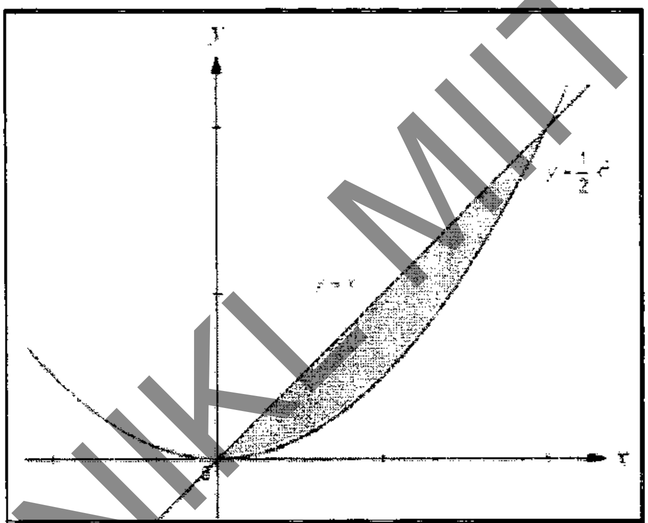

Figure 4

i. Determine the x-coordinates of the intersection points.

(3 marks)

ii. Calculate the volume of the shaded region when the region is rotated $360°$ about the x-axis.

(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
$\int_a^b f(x)dx = \left[F(x)\right]_a^b = F(b) - F(a)$

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
$V = \pi\int_a^b \left[f(x)\right]^2 dx$	$V = \pi\int_a^b \left[f(x)\right]^2 - \left[g(x)\right]^2 dx$