

SULIT



**KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2025/2026

DBM20023 : ENGINEERING MATHEMATICS 2

TARIKH : 01 DISEMBER 2025

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 100 MARKS***BAHAGIAN A : 100 MARKAH*****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan berstruktur. Jawab semua soalan.

QUESTION 1***SOALAN 1***

CLO1

(a) Write each of the following in the simplest form:

Tulis setiap fungsi yang berikut dalam bentuk paling ringkas:

i) $2a^{n+2} \times 3a^n \div a^{5n}$

[3 marks]

[3 markah]

ii) $p^2q^5 \div pq^2$

[3 marks]

[3 markah]

iii) $2 \log_m 3 + 5 \log_m t - \log_m t^2$

[4 marks]

[4 markah]

CLO2 (b) Solve the following equations using the suitable method.

Selesaikan persamaan-persamaan berikut menggunakan kaedah yang sesuai.

i) $9^{3x+4} = 27^{x+3}$

[5 marks]

[5 markah]

ii) $3^{3x-2} = 5$

[5 marks]

[5 markah]

iii) $\log_3(2x - 1) - 2 = 0$

[5 marks]

[5 markah]

QUESTION 2

SOALAN 2

CLO1

(a) Compute:

*Hitungkan:*i) first order differentiation, $\frac{dy}{dx}$ for equation $y = (2x + 6)(x + 3)$ *pembezaan peringkat pertama, $\frac{dy}{dx}$ untuk persamaan $y = (2x + 6)(x + 3)$*

[3marks]

[3 markah]

ii) first order partial differentiation $\frac{\delta z}{\delta x}$ and $\frac{\delta z}{\delta y}$ for equation $z = 9x^3 + xy^4 - y^7$ *pembezaan separa peringkat pertama, $\frac{\delta z}{\delta x}$ dan $\frac{\delta z}{\delta y}$ bagi persamaan*

$$z = 9x^3 + xy^4 - y^7$$

[4 marks]

[4 markah]

iii) second derivative for the function $y = 8x^2 - \frac{3}{x}$ *terbitan kedua bagi fungsi $y = 8x^2 - \frac{3}{x}$*

[5 marks]

[5 markah]

CLO2 (b) Compute the derivatives $\frac{dy}{dx}$ of the following equations:

Hitung terbitan $\frac{dy}{dx}$ bagi fungsi berikut:

i) $y = \ln(5x^6 + 3x - 9)$

[3 marks]

[3 markah]

ii) $y = 7e^{3x}(8 + 2e^{5x})$

[4 marks]

[4 markah]

iii) $y = (x - 3)^2 \sin 5x$

[6 marks]

[6 markah]

QUESTION 3**SOALAN 3**

- CLO2 (a) Calculate the stationary points of the equation $y = x^3 - 3x + 2$, then determine their nature of the point.

Kira titik-titik pegun bagi persamaan $y = x^3 - 3x + 2$, seterusnya tentukan sifatnya.

[10 marks]

[10 markah]

- CLO1 (b) Solve the following integrals:

Selesaikan kamiran berikut:

i) $\int \frac{3x^2}{5} - 2x + \frac{7}{x^6} dx$

[4 marks]

[4 markah]

ii) $\int \frac{12}{(3+2x)^4} dx$ (Use substitution method)
(Guna kaedah penggantian)

[5 marks]

[5 markah]

iii) $\int_2^3 (5 + 3x)(3 + 8x) dx$

[6 marks]

[6 markah]

QUESTION 4**SOALAN 4**

CLO2

(a) Solve the following integrals using integration by parts.

Selesaikan kamiran-kamiran berikut menggunakan kamiran bahagian demi bahagian.

i) $\int 2xe^{3x} dx$

[5 marks]

[5 markah]

ii) $\int x \cos 4x dx$

[5 marks]

[5 markah]

CLO1

(b)

- i) Refer to Figure 4(b)i, calculate the area of the shaded region bounded by the curve $x = y^2 - 4y + 3$ and $y = 1, y = 3$

Merujuk Rajah 4(b)i, kira luas kawasan berlorek yang dibatasi oleh lengkung $x = y^2 - 4y + 3$ dan garis $y = 1, y = 3$.

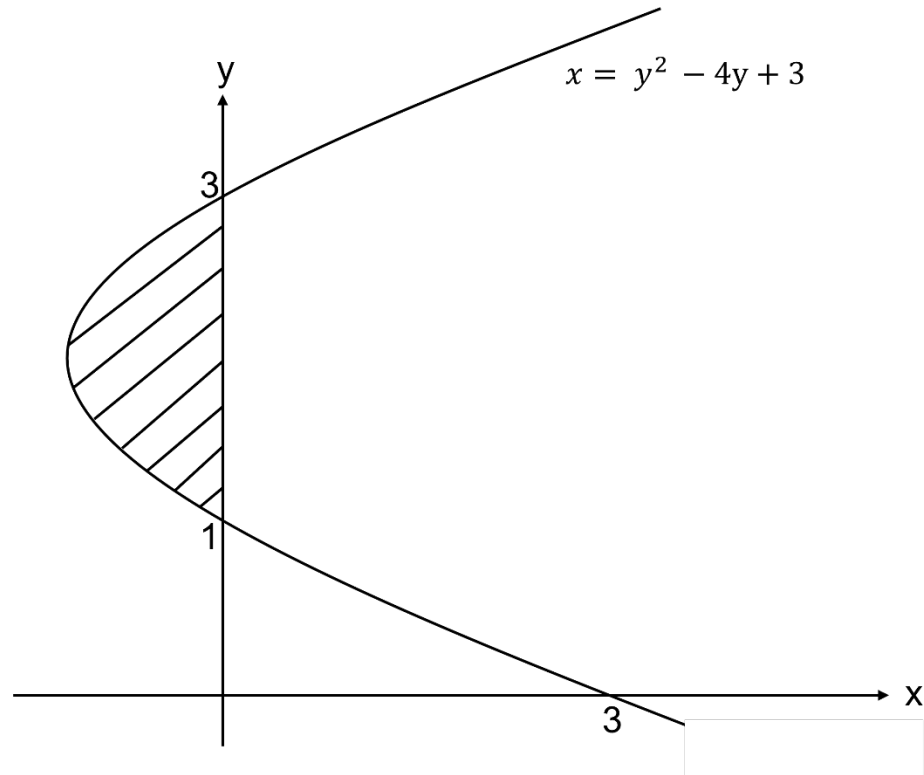


Figure 4(b)i / Rajah 4(b)i

[7 marks]

[7 markah]

- ii) Calculate the volume of the solid formed when the area between the curve $y = \frac{2}{x^2}$ and the x-axis from $x = -4$ and $x = -1$ rotated through 360° about x-axis.

Kira isipadu pepejal yang terbentuk apabila luas antara lengkung $y = \frac{2}{x^2}$ dan paksi-x daripada $x = -4$ dan $x = -1$ berputar melalui 360°

[8 marks]

[8 markah]

SOALAN TAMAT

FORMULA SHEET FOR DBM20023

EXPONENTS AND LOGARITHMS			
LAW OF EXPONENTS		LAW OF LOGARITHMS	
1.	$a^m \times a^n = a^{m+n}$	8.	$\log_a a = 1$
2.	$\frac{a^m}{a^n} = a^{m-n}$	9.	$\log_a 1 = 0$
3.	$(a^m)^n = a^{m \times n}$	10.	$\log_a b = \frac{\log_c b}{\log_c a}$
4.	$a^0 = 1$	11.	$\log_a MN = \log_a M + \log_a N$
5.	$a^{-n} = \frac{1}{a^n}, a \neq 0$	12.	$\log_a \frac{M}{N} = \log_a M - \log_a N$
6.	$\frac{m}{a^n} = (\sqrt[n]{a})^m$	13.	$\log_a N^P = P \log_a N$
7.	$(ab)^n = a^n b^n$	14.	$N = a^x \Leftrightarrow \log_a N = x$

DIFFERENTIATION			
1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	2.	$\frac{d}{dx}(ax^n) = anx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(ax + b)^n = n(ax + b)^{n-1} \times \frac{d}{dx}(ax + b)$ [Composite Rule]		
4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	5.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$ [Product Rule]
6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$ [Quotient Rule]	7.	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$ [Chain Rule]
8.	$\frac{d}{dx}(e^x) = e^x$	9.	$\frac{d}{dx}(e^{ax+b}) = e^{ax+b} \times \frac{d}{dx}(ax + b)$
10.	$\frac{d}{dx}(\ln x) = \frac{1}{x}$	11.	$\frac{d}{dx}[\ln ax + b] = \frac{1}{ax + b} \times \frac{d}{dx}(ax + b)$
12.	$\frac{d}{dx}(\sin x) = \cos x$	13.	$\frac{d}{dx}(\cos x) = -\sin x$

14.	$\frac{d}{dx}(\tan x) = \sec^2 x$	15.	$\frac{d}{dx}[\sin(ax + b)] = \cos(ax + b) \times \frac{d}{dx}(ax + b)$
16.	$\frac{d}{dx}[\cos(ax + b)] = -\sin(ax + b) \times \frac{d}{dx}(ax + b)$	17.	$\frac{d}{dx}[\tan(ax + b)] = \sec^2(ax + b) \times \frac{d}{dx}(ax + b)$
18.	$\frac{d}{dx}[\sin^n u] = n \sin^{n-1} u \times \cos u \times \frac{du}{dx}$	19.	$\frac{d}{dx}[\cos^n u] = n \cos^{n-1} u \times -\sin u \times \frac{du}{dx}$
20.	$\frac{d}{dx}[\tan^n u] = n \tan^{n-1} u \times \sec^2 u \times \frac{du}{dx}$		

INTEGRATION

1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c; \{n \neq -1\}$	2.	$\int (ax + b)^n dx = \frac{(ax + b)^{n+1}}{(a)(n+1)} + c; \{n \neq -1\}$
3.	$\int k dx = kx + c, k \text{ is constant}$	4.	$\int_a^b f(x) dx = F(b) - F(a)$
5.	$\int \frac{1}{x} dx = \ln x + c$	6.	$\int \frac{1}{ax + b} dx = \frac{1}{a} \times \ln ax + b + c$
7.	$\int e^x dx = e^x + c$	8.	$\int e^{ax+b} dx = \frac{1}{a} \times e^{ax+b} + c$
9.	$\int \sin x dx = -\cos x + c$	10.	$\int \cos x dx = \sin x + c$
11.	$\int \sec^2 x dx = \tan x + c$		
12.	$\int \sin(ax + b) dx = -\frac{1}{a} \times \cos(ax + b) + c$		
13.	$\int \cos(ax + b) dx = \frac{1}{a} \times \sin(ax + b) + c$		
14.	$\int \sec^2(ax + b) dx = \frac{1}{a} \times \tan(ax + b) + c$		

IDENTITY TRIGONOMETRY			
1.	$\cos^2 \theta + \sin^2 \theta = 1$	2.	$1 + \tan^2 \theta = \sec^2 \theta$
3.	$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$	4.	$\sin 2\theta = 2 \sin \theta \cos \theta$
5.	$\cos 2\theta = 2 \cos^2 \theta - 1$ $= 1 - 2 \sin^2 \theta$ $= \cos^2 \theta - \sin^2 \theta$	6.	$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$
7.	$\tan \theta = \frac{\sin \theta}{\cos \theta}$	8.	$\cot \theta = \frac{\cos \theta}{\sin \theta} = \frac{1}{\tan \theta}$
9.	$\sec \theta = \frac{1}{\cos \theta}$	10.	$\operatorname{cosec} \theta = \frac{1}{\sin \theta}$
AREA UNDER CURVE			
1.	$A_x = \int_a^b y \, dx$	2.	$A_y = \int_a^b x \, dy$
VOLUME UNDER CURVE			
1.	$V_x = \pi \int_a^b y^2 \, dx$	2.	$V_y = \pi \int_a^b x^2 \, dy$
INTEGRATION BY PARTS			
$\int u \, dv = uv - \int v \, du$			