

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 II : 2024/2025

DBM20023 : ENGINEERING MATHEMATICS 2

TARIKH : 13 MEI 2025

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

Kertas ini mengandungi EMPAT (4) soalan berstruktur. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

CLO1

- (a) Write each of the following expression in the simplest form.

Tuliskan setiap ungkapan berikut dalam bentuk yang paling ringkas.

i.
$$\frac{4wk^2 \times w^{-2}}{24 w^3 k}$$
 [3 marks]

[3 markah]

ii.
$$243 \div 3^{-2+n} \times 81^{4n}$$
 [3 marks]

[3 markah]

iii.
$$\log_a 2^5 - 3 + \log_a \sqrt{p^2}$$
 [4 marks]

[4 markah]

CLO2

(b) Solve the following equations using suitable method:

Selesaikan persamaan-persamaan berikut menggunakan kaedah yang sesuai:

i. $2^{m-2} \times 16^m = 512$

[4 marks]

[4 markah]

ii. $1 + 2 \log_7 x = \log_7(5x + 6)$

[5 marks]

[5 markah]

iii. $5^{x-2} = 15$

[6 marks]

[6 markah]

QUESTION 2**SOALAN 2**

CLO1

- (a) i. Solve the differentiation of
- $y = 2(-4x^2 - \frac{3}{x^3})$

Selesaikan pembezaan bagi $y = 2(-4x^2 - \frac{3}{x^3})$

[3 marks]

[3 markah]

- ii. Compute the second derivative for the function
- $y = \sqrt{5x + 7}$

Hitungkan terbitan peringkat kedua bagi fungsi $y = \sqrt{5x + 7}$

[5 marks]

[5 markah]

- iii. Compute the first order partial differentiation
- $\frac{\partial z}{\partial x}$
- and
- $\frac{\partial z}{\partial y}$
- for the function

$$z = 7x^3y^5 - 3x^4y$$

Hitungkan pembezaan separa peringkat pertama $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ bagi fungsi

$$z = 7x^3y^5 - 3x^4y$$

[4 marks]

[4 markah]

CLO2 (b) Solve the derivative $\frac{dy}{dx}$ for each of the following equations.

Selesaikan pembezaan $\frac{dy}{dx}$ bagi setiap fungsi berikut.

i. $y = \frac{4}{5} e^{-3x^2} + 6e^x$

[3 marks]

[3 markah]

ii. $y = \ln\left(\frac{3x-7}{-8+2x^3}\right)$

[4 marks]

[4 markah]

iii. $y = (\sin 3x) (3x^3 + x)^2$

[6 marks]

[6 markah]

QUESTION 3**SOALAN 3**

- CLO2 (a) Calculate the stationary points for $y = x^3 - 3x^2 + 5$, then identify the nature of the stationary points.

Kirakan titik-titik pegun bagi persamaan $y = x^3 - 3x^2 + 5$, kemudian kenalpasti sifat titik-titik tersebut.

[10 marks]

[10 markah]

- CLO1 (b) Calculate the following integrals:

Kirakan kamiran berikut:

i. $\int_0^2 (x + 5)(2 - x) dx$

[5 marks]

[5 markah]

ii. $\int \frac{3e^{7x} + 6e^{6x} - 12e^{5x}}{e^{4x}} dx$

[5 marks]

[5 markah]

iii. $\int \frac{2x}{x^2 + 5} dx$ (Using Substitution Method)

[5 marks]

[5 markah]

QUESTION 4**SOALAN 4**

CLO2

- (a) Solve the following integrals using integration by parts:

Selesaikan kemiran-kamiran berikut menggunakan kamiran bahagian demi bahagian:

i. $\int 3x \sin 3x \, dx$

[5 marks]

[5 markah]

ii. $\int 2xe^{5x} \, dx$

[5 marks]

[5 markah]

CLO1

- (b) i. Given a graph
- $y = (x + 1)(2x - 5)$
- . Calculate the area under the graph bounded by the curve, x-axis, the lines
- $x = 3$
- and
- $x = 6$
- .

Diberi graf $y = (x + 1)(2x - 5)$. Kirakan luas di bawah graf yang dilingkungi oleh lengkungan itu, paksi-x, garisan $x = 3$ dan $x = 6$.

[7 marks]

[7 markah]

CLO2

- ii. Figure 4(b) shows an enclosed region between the curve $x = y^2 - 3y$ and y-axis between $y = 0$ and $y = 3$. Calculate the volume of the shaded region when rotated 360° about y-axis.

Rajah 4(b) menunjukkan kawasan tertutup antara lengkung $x = y^2 - 3y$ dan paksi- y antara $y = 0$ dan $y = 3$. Kirakan isipadu kawasan berlorek apabila diputar 360° pada paksi y .

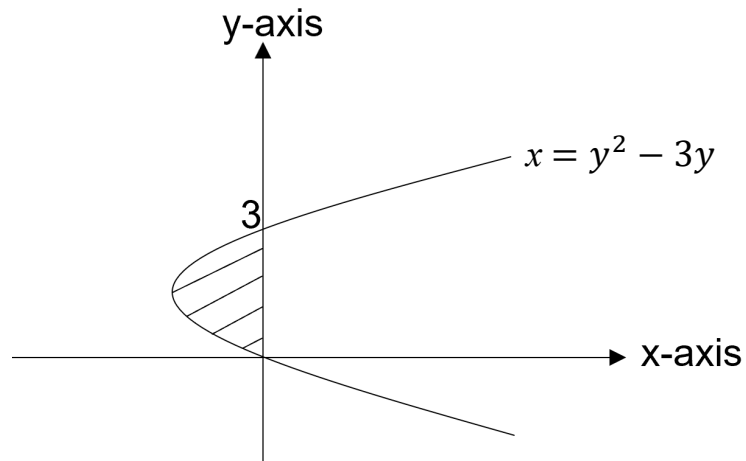


Figure 4(b)
Rajah 4(b)

[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.	$a^{\frac{m}{n}} = (\sqrt[n]{a})^m$	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.	$\frac{d}{dx}(ax^n) = anx^{n-1} \text{ [Power Rule]}$
3.	$\frac{d}{dx}(ax+b)^n = n(ax+b)^{n-1} \times \frac{d}{dx}(ax+b) \text{ [Composite Rule]}$		
4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	5.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \text{ [Product Rule]}$
6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2} \text{ [Quotient Rule]}$	7.	$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx} \text{ [Chain Rule]}$
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			
$\int u \, dv = uv - \int v \, du$			