

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

DBM20173 : ENGINEERING MATHEMATICS 2

TARIKH : 13 MEI 2025

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas ini mengandungi **TUJUH (7)** 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 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) Simplify each of the following expression below:

Ringkaskan setiap ungkapan berikut:

i. $9^{3m} \times 3^{2m+4} \div 27^{2m+1}$

[5 marks]

[5 markah]

ii. $4\log_2 p + \log_2 q^5 + 3 - \log_2 p^2$

[5 marks]

[5 markah]

CLO2 (b) Solve the following equations:

Selesaikan persamaan-persamaan berikut:

i. $4^{3x} \times 16^{x-1} = 64$

[5 marks]

[5 markah]

ii. $\log_2(x+6) = 2 + \log_2 3x$

[5 marks]

[5 markah]

iii. $2^{\log_3(x-8)} = 16$

[5 marks]

[5 markah]

QUESTION 2**SOALAN 2**

CLO1

- (a) Write the derivative $\frac{dy}{dx}$ for the following equations:

Tulis pembezaan $\frac{dy}{dx}$ bagi persamaan berikut:

i. $y = 5\sqrt{x} + 4x$

[3 marks]

[3 markah]

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

[4 marks]

[4 markah]

CLO2

- (b) Show the derivative $\frac{dy}{dx}$ for each of the following functions:

Tunjukkan pembezaan $\frac{dy}{dx}$ bagi setiap fungsi berikut:

i. $y = \sin^2(7x + 5)$

[4 marks]

[4 markah]

ii. $y = 5e^{4x}\cos 3x$

[5 marks]

[5 markah]

CLO2

(c) Compute:

Hitungkan:

- i. the derivative $\frac{dy}{dx}$ for the parametric equation function given below:

pembezaan $\frac{dy}{dx}$ bagi fungsi persamaan parametrik seperti di bawah:

$$x = 9t^2 + 4t^5$$

$$y = 3 \ln 6t$$

[4 marks]

[4 markah]

- ii. the $\frac{\delta z}{\delta x}$, $\frac{\delta z}{\delta y}$, $\frac{\delta^2 z}{\delta y \delta x}$ and $\frac{\delta^2 z}{\delta x \delta y}$ for the function below.

$\frac{\delta z}{\delta x}$, $\frac{\delta z}{\delta y}$, $\frac{\delta^2 z}{\delta y \delta x}$ dan $\frac{\delta^2 z}{\delta x \delta y}$ bagi persamaan di bawah.

$$z = (2 - 4x)(3y + 2x)$$

[5 marks]

[5 markah]

QUESTION 3

SOALAN 3

- CLO2 (a) Calculate the stationary point of the curve $y = x^3 - 6x^2 + 9x + 5$ and its nature.

Kirakan titik pegun dan sifatnya bagi lengkungan $y = x^3 - 6x^2 + 9x + 5$.

[10 marks]

[10 markah]

- CLO2 (b) Solve the following integrals using the substitution method. Given $u = x^2 + 3x + 5$.

Selesaikan kamiran berikut menggunakan kaedah gantian.

Diberi $u = x^2 + 3x + 5$.

$$\int_1^2 \frac{2x + 3}{x^2 + 3x + 5} dx$$

[7 marks]

[7 markah]

- CLO1 (c) Solve the following integrals.

Selesaikan kamiran berikut.

i. $\int (8x + 7)^{\frac{1}{2}} dx$

[3 marks]

[3 markah]

ii. $\int_{-1}^2 2x(x^2 + 5) dx$

[5 marks]

[5 markah]

QUESTION 4

SOALAN 4

CLO2

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

Selesaikan kamiran-kamiran berikut menggunakan kamiran bahagian demi bahagian.

i. $\int x e^{3x} dx$

[4 marks]

[4 markah]

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

[7 marks]

[7 markah]

(b)

CLO1

- i. Figure 4(b)i shows an enclosed region between the curve of $y = x^2 - 4$ and x-axis between $x = 2$ and $x = 4$. Calculate the area of the shaded region.

Rajah 4(b)i menunjukkan kawasan tertutup antara lengkung $y = x^2 - 4$ dan paksi-x antara $x=2$ dan $x=4$. Kirakan luas kawasan berlorek.

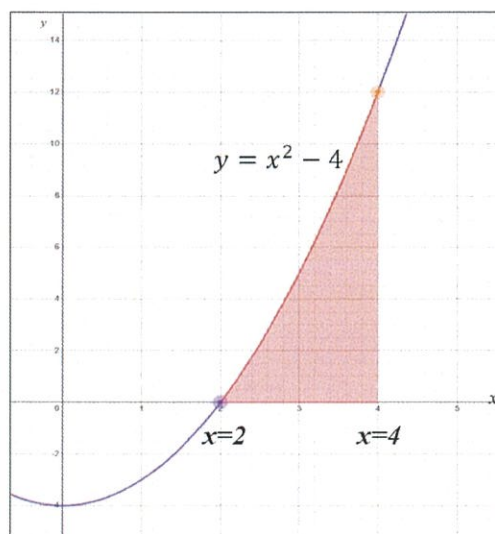


Figure 4(b)i/ *Rajah 4(b)i*

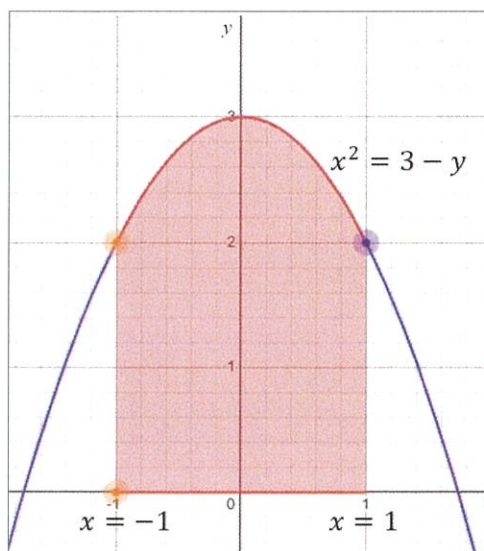
[6 marks]

[6 markah]

- ii. Figure 4(b)ii shows the graph of $x^2 = 3 - y$ between $x = -1$ and $x = 1$. Calculate the volume of the shaded region when it is rotated 360° about x -axis.

Rajah 4(b)ii menunjukkan graf $x^2 = 3 - y$ antara $x = -1$ dan $x = 1$.

Kirakan isipadu kawasan berlorek apabila diputar 360° pada paksi- x .

Figure 4(b)ii/ *Rajah 4(b)ii*

[8 marks]

[8 markah]

SOALAN TAMAT

FORMULA SHEET FOR DBM20173

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.	$\frac{d}{dx}(ax^n) = anx^{n-1}$ [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.	$\int \sec^2(ax+b) dx = \frac{1}{a} \times \tan(ax+b) + c$		

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			
$\int u dv = uv - \int v du$			