

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

DBM20173: ENGINEERING MATHEMATICS 2

TARIKH : 01 DISEMBER 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:

Permudahkan setiap ungkapan yang berikut:

i.
$$\frac{5^{n-4}}{25^{3n} \times 125^{2n-1}}$$

[5 marks]

[5 markah]

ii.
$$2 + 4 \log_8 p - 2 \log_8 q + \frac{1}{3} \log_8 p$$

[5 marks]

[5 markah]

CLO2

- b) Calculate the following equations:

Kirakan persamaan-persamaan berikut:

i.
$$3^{5-x} = 81\sqrt{3}$$

[4 marks]

[4 markah]

ii.
$$4^{2x+1} = 5$$

[5 marks]

[5 markah]

iii.
$$\log_5 x = \log_{25}(3 - 2x^2)$$

[6 marks]

[6 markah]

QUESTION 2**SOALAN 2**

CLO1

a) Write the derivative $\frac{dy}{dx}$ for the following equations:*Tuliskan pembezaan $\frac{dy}{dx}$ bagi persamaan berikut:*

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

[3 marks]

[3 markah]

ii.
$$y = x^2 \left(7x - \frac{4}{x^4} + 3 \right)$$

[4 marks]

[4 markah]

CLO2

b) Calculate the derivative $\frac{dy}{dx}$ for the following equations:*Kirakan pembezaan $\frac{dy}{dx}$ bagi persamaan berikut:*

i.
$$y = \cos^2 4x^4$$

[4 marks]

[4 markah]

ii.
$$y = 5x^3 \ln(3x + 6)$$

[5 marks]

[5 markah]

CLO2

c) Compute:

Hitungkan:

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

pembezaan $\frac{dy}{dx}$ bagi fungsi persamaan parametrik yang diberikan:

$$y = 5 \ln 5t$$

$$x = 4t^5 - 5t^3$$

[4 marks]

[4 markah]

- ii. $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial y^2}$ and $\frac{\partial^2 z}{\partial x \partial y}$ for function $z = (8x + 3y)(7x + 5y)$.

$\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$, $\frac{\partial^2 z}{\partial y^2}$ dan $\frac{\partial^2 z}{\partial x \partial y}$ bagi fungsi $z = (8x + 3y)(7x + 5y)$.

[5 marks]

[5 markah]

QUESTION 3**SOALAN 3**

- CLO2 a) Calculate the stationary points of the equation $y = 4x^3 - 3x^2 + 3$, then determine their nature of the point.
Kirakan titik-titik pegun bagi persamaan $y = 4x^3 - 3x^2 + 3$, seterusnya tentukan sifatnya.
- [10 marks]
[10 markah]
- CLO2 b) Solve the following integrals by using substitution method:
Selesaikan kamiran berikut dengan menggunakan kaedah penggantian:
- i. $\int 8xe^{4x^2-1} dx$; given $u = 4x^2 - 1$
- [4 marks]
[4 markah]
- ii. $\int 3x^2 \sec^2 x^3 dx$; given $u = x^3$
- [4 marks]
[4 markah]
- CLO1 c) Solve the following integrals:
Selesaikan kamiran berikut:
- i. $\int \frac{x^3}{2} - x + \frac{7}{x^5} dx$
- [3 marks]
[3 markah]
- ii. $\int_0^1 (x + 6)(1 + x) dx$
- [4 marks]
[4 markah]

QUESTION 4**SOALAN 4**

CLO2

a) Solve the following integrals by using integrations by parts.

Selesaikan kamiran berikut menggunakan kamiran bahagian demi bahagian.

i. $\int \frac{x^2}{2} \ln x \, dx$

[5 marks]

[5 markah]

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

[5 marks]

[5 markah]

CLO1

b)

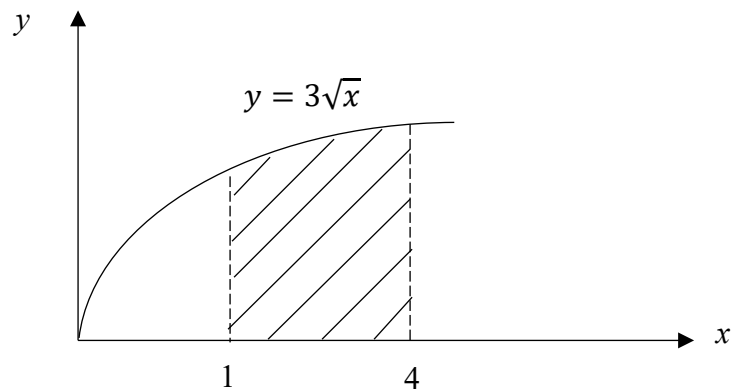
i. Figure 4b(i) shows an enclosed region between the curve and x-axis of $y = 3\sqrt{x}$ where $x = 1$ and $x = 4$. Calculate the shaded area.*Rajah 4b(i) menunjukkan kawasan tertutup bagi lengkung dan paksi- x bagi $y = 3\sqrt{x}$ di mana $x = 1$ dan $x = 4$. Hitungkan luas kawasan berlorek.*

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

[7 marks]

[7 markah]

- ii. Figure 4b(ii) shows an enclosed region between the curve and y -axis of $x = y^2 - 2$ where $y = 0$ and $y = 1$. Calculate the volume of bounded region when it is rotated 360° at y -axis.

Rajah 4b(ii) menunjukkan kawasan tertutup bagi lengkung dan paksi- y bagi $x = y^2 - 2$ di mana $y = 0$ dan $y = 1$. Hitungkan isipadu kawasan berlerek apabila diputar 360° pada paksi $-y$.

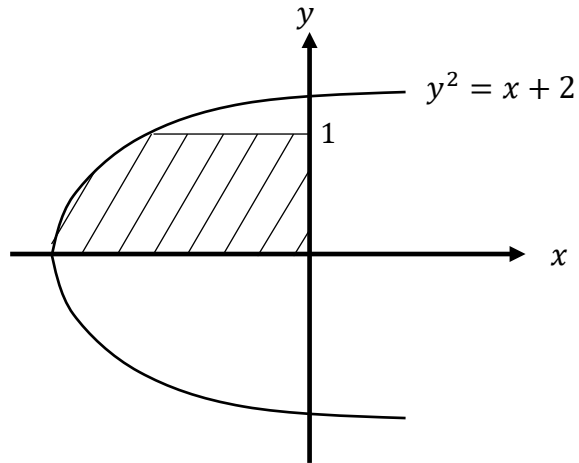


Figure 4b(ii) / Rajah 4b(ii)

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