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
C3

(a) Simplify each of the following expressions:

Permudahkan setiap ungkapan yang berikut:

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

[3 marks]

[3 *markah*]

ii. $3\log p + 2\log p - \dfrac{\log p}{4}$

[4 marks]

[4 *markah*]

CLO2
C3

(b) Solve the following equations:

Selesaikan persamaan berikut:

i. $3^{4x+1} \bullet 9^{x-1} = 81$

[4 marks]

[*4 markah*]

ii. $2\log_3 x - \log_9 4 = 0$

[4 marks]

[*4 markah*]

CLO1
C3

(c) Differentiate the following functions:

Bezakan fungsi-fungsi berikut:

i. $y = 5x^2 + \frac{2}{x^4}$

[3 marks]

[*3 markah*]

ii. $y = (7 - 4x^5)^3$

[2 marks]

[2 *markah*]

iii. $y = (x+2)^3(2x-5)^2$

[5 marks]

[5 *markah*]

QUESTION 2

SOALAN 2

CLO1
C3

(a)

i. Given that $z = 3xy + 10x^3y^2 - 5$. Determine:

Diberi $z = 3xy + 10x^3y^2 - 5$. *Tentukan:*

a. $\frac{\partial z}{\partial x}$

[1 mark]

[*1 markah*]

b. $\frac{\partial z}{\partial y}$

[1 mark]

[*1 markah*]

c. $\frac{\partial^2 z}{\partial x \partial y}$

[1 mark]

[*1 markah*]

d. $\frac{\partial^2 z}{\partial x^2}$

[1 mark]

[*1 markah*]

ii. Given that $5y^2 - 3x^3 = 4y$. Determine $\frac{dy}{dx}$.

Diberi $5y^2 - 3x^3 = 4y$. *Tentukan* $\frac{dy}{dx}$

[5 marks]

[*5 markah*]

CLO2
C3

(b) Differentiate the following functions:
Bezakan fungsi yang berikut:

i. $y = \frac{7}{8}\sin(4x+1)$

[3 marks]
[*3 markah*]

ii. $y = 4e^{5x^2}$

[3 marks]
[*3 markah*]

CLO2
C3

(c) Find the stationary point for the function of $y = 2x^3 - 4x^2$. Then determine their nature.
Cari titik pegun bagi fungsi $y = 2x^3 - 4x^2$. *Kemudian tentukan sifat titik-titik tersebut.*

[10 marks]
[*10 markah*]

QUESTION 3

SOALAN 3

CLO1
C3

(a) Solve the following integrals.

Selesaikan setiap kamiran yang berikut.

i. $\int -7 + sec^2 5x \ dx$

[2 marks]

[*2 markah*]

ii. $\int \frac{3}{2x-3} dx$

[2 marks]

[*2 markah*]

iii. $\int e^{1-3x} + 5x^2 - 8 \ dx$

[3 marks]

[*3 markah*]

iv. $\int \frac{1}{x^2} - \frac{2}{x^3} \ dx$

[3 marks]

[*3 markah*]

CLO2
C3

(b) Solve the following integrals.

Selesaikan setiap kamiran yang berikut.

i. $\int 2x \sin x^2 \ dx$

[4 marks]

[*4 markah*]

ii. $\int xe^{3x^2}\,dx$

[4 marks]

[*4 markah*]

iii. $\int_1^2 \frac{x^2+1}{x^3+3x}\,dx$

[7 marks]

[*7 markah*]

QUESTION 4

SOALAN 4

CLO1
C3

(a) Refer to the Figure 4(a), determine the volume generated when the shaded region rotated 360° on the x-axis.

Merujuk Rajah 4(a), tentukan isipadu janaan apabila kawasan berlorek diputarkan 360° pada paksi-x.

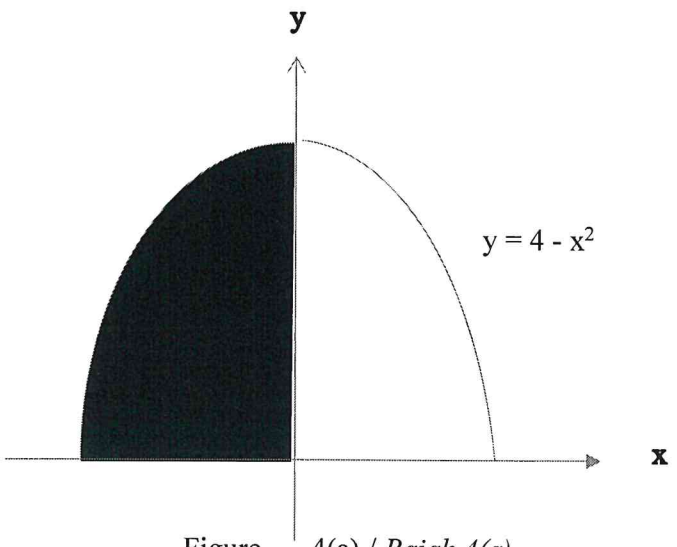

Figure 4(a) / *Rajah 4(a)*

[*12 marks*]

[*12 markah*]

CLO2
C3

(b) Solve the following integrals using by part method:

Selesaikan kamiran-kamiran berikut menggunakan kaedah bahagian demi bahagian:

i. $\int 2x \ln x dx$

[*5 marks*]

[5 *markah*]

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

[8 *marks*]

[*8 markah*]

SOALAN TAMAT

FORMULA SHEET FOR DBM20023

EXPONENTS AND LOGARITHMS

LAW OF EXPONENTS

1.	$a^m \times a^n = a^{m+n}$
2.	$\frac{a^m}{a^n} = a^{m-n}$
3.	$(a^m)^n = a^{m \times n}$
4.	$a^0 = 1$
5.	$a^{-n} = \frac{1}{a^n}, a \neq 0$
6.	$a^{\frac{m}{n}} = (\sqrt[n]{a})^m$
7.	$(ab)^n = a^n b^n$

LAW OF LOGARITHMS

8.	$\log_a a = 1$
9.	$\log_a 1 = 0$
10.	$\log_a b = \frac{\log_c b}{\log_c a}$
11.	$\log_a MN = \log_a M + \log_a N$
12.	$\log_a \frac{M}{N} = \log_a M - \log_a N$
13.	$\log_a N^P = P \log_a N$
14.	$N = a^x \Leftrightarrow \log_a N = x$

DIFFERENTIATION

1.	$\frac{d}{dx}[k] = 0$, k is constant	2.	$\frac{d}{dx}[ax^n] = nax^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$	4.	$\frac{d}{dx}[a\{u(x)\}^n] = na\{u(x)\}^{n-1} \cdot u'(x)$ [Composite]
5.	$\frac{d}{dx}[ae^{u(x)}] = ae^{u(x)} \cdot u'(x)$	6.	$\frac{d}{dx}[a\ln u(x)] = \frac{a}{u(x)} \cdot u'(x)$
7.	$\frac{d}{dx}[a \sin u(x)] = a \cos u(x) \cdot u'(x)$	8.	$\frac{d}{dx}[a \sin^n u(x)] = an \cos u(x) \cdot \sin^{n-1} u(x) \cdot u'(x)$
9.	$\frac{d}{dx}[a \cos u(x)] = -a \sin u(x) \cdot u'(x)$	10.	$\frac{d}{dx}[a \cos^n u(x)] = -an \sin u(x) \cdot \cos^{n-1} u(x) \cdot u'(x)$
11.	$\frac{d}{dx}[a \tan u(x)] = a sec^2 u(x) \cdot u'(x)$	12.	$\frac{d}{dx}[a \tan^n u(x)] = an \tan^{n-1} u(x) \cdot sec^2 u(x) \cdot u'(x)$
13.	$\frac{d}{dx}[y\{u(x)\}] = \frac{dy}{du} \times \frac{du}{dx}$ [Chain Rule]	14.	$\frac{d}{dx}[u(x) \cdot v(x)] = u\frac{dv}{dx} + v\frac{du}{dx}$ [Product Rule]
15.	$\frac{d}{dx}\left[\frac{u(x)}{v(x)}\right] = \frac{\left(v\frac{du}{dx} - u\frac{dv}{dx}\right)}{(v)^2}$ [Quotient Rule]	16.	$\frac{dy(t)}{dx(t)} = \frac{dy(t)}{dt} \times \frac{dt}{dx(t)}$ [Parametric Equation]

INTEGRATION			
1.	$\int k\ dx = kx + c$, k is constant	2.	$\int ax^n dx = \frac{ax^{n+1}}{(n+1)} + c \quad ;\{n \neq -1\}$
3.	$\int [f(x) \pm g(x)]\ dx = \int f(x)\,dx \pm \int g(x)\,dx$	4.	$\int a[u(x)]^n dx = \frac{a[u(x)]^{n+1}}{(n+1)\cdot u'(x)} + c \quad ;\{n \neq -1\}$
5.	$\int_a^b f(x)dx = F(b) - F(a)$	6.	$\int \frac{a}{[u(x)]^n}\ dx = \frac{a\ln[u(x)]}{u'(x)} \quad ;\{n = 1\}$
7.	$\int e^{u(x)}\ dx = \frac{e^{u(x)}}{u'(x)} + c$	8.	$\int a \sin u(x)\ dx = -\frac{a\cos u(x)}{u'(x)} + c$
9.	$\int a \cos u(x)dx = \frac{a \sin\ u(x)}{u'(x)} + c$	10.	$\int a \sec^2 u(x)\ dx = \frac{a \tan u(x)}{u'(x)} + c$
IDENTITY TRIGONOMETRY			
1.	$cos^2\theta + sin^2\theta = 1$	2.	$1 + tan^2\theta = sec^2\theta$
3.	$1 + cot^2\theta = cosec^2\theta$	4.	$\sin 2\theta = 2\sin\theta\cos\theta$
5.	$\cos 2\theta = 2cos^2\theta - 1$ $= 1 - 2sin^2\theta$ $= cos^2\theta - sin^2\theta$	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.	$cosec\ \theta = \frac{1}{\sin\theta}$
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			
$\int u\,dv = uv - \int v\,du$			