UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	MATHEMATICS II
COURSE CODE	:	DSM 1923
PROGRAMME	:	3 DDT/ DDM/ DFT
EXAMINATION DATE	:	OCTOBER 2012
DURATION	:	3 HOURS
INSTRUCTIONS	:	ANSWER **ALL** QUESTIONS IN **PART A & THREE (3)** QUESTIONS IN **PART B**

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

PART A

Q1 (a) Given two curve $y_1 = 4x + 16$ and $y_2 = 2x^2 + 10$

(i) Sketch both curve and show the region bounded between both curves

(ii) Find two (2) intersect point of both curve

(iii) Thus, calculate the area bounded between both curves

(13 marks)

(b) The region R is bounded by the graph of $f(x) = x^2 + 1$, $y = 0$, $x = 0$ and $x = 1$.

(i) Sketch the graph of $f(x) = x^2 + 1$

(ii) Show the radius (r) and height (h) of the solid generated when region R is revolved about the y-axis

(iii) Find the volume of the generated solid by cylindrical method

(12 marks)

PART B

Q2 (a) Evaluate

(i) $\int\left(3x^2+3\sqrt[4]{x}-\frac{4}{x^3}\right)dx$

(ii) $\int\left(\frac{x+3x^2}{x}\right)dx$

(iii) $\int\left(2\ln x+e^x\right)dx$

(iv) $\int_0^2\left(x(1+x^2)\right)dx$

(13 marks)

(b) By using substitution technique, evaluate $\int\left(\frac{2x}{(x^2+1)^2}\right)dx$

(6 marks)

(c) Solve $\int\left(2x^2\sin x\right)dx$ by using integration by tabular method

(6 marks)

Q3 (a) By referring to the Diagram Q3 (a), find

(i) $\lim_{x\to 1} f(x)$

(ii) $\lim_{x\to 3} f(x)$

(6 marks)

(b) Compute the limit

(i) $\lim_{x\to 3}\frac{x^2-6x+8}{x^2-4}$

(ii) $\lim_{x\to 0}\frac{3}{\sqrt{16+3x}+4}$

(iii) $\lim_{x\to\infty} 3x^4 - 6x^2 + x + 10$

(iv) $\lim_{x\to\infty} \dfrac{3+2x+4x^2}{x^2+2x}$

(10 marks)

(c) Given $f(x) = \begin{cases} \dfrac{x^2-4x+3}{x-3} & , x \neq 3 \\ 2 & , x = 3 \end{cases}$

Find:

(i) $\lim_{x\to 3} f(x)$

(ii) $f(3)$

(ii) Thus, determine whether $f(x)$ is continue at $x = 3$

(9 marks)

Q4 (a) Find the derivatives of the following

(i) $y = 4\sqrt{x} + \dfrac{1}{4}x^4 + x + 1$

(ii) $y = 2x - e^{2x}$

(iii) $y = 2x\cos x - 4x^3$

(iv) $y = \ln(\sin 3x)^2$

(19 marks)

(b) Find $\frac{dy}{dx}$ of the implicit equation of $x^2 + xy - y^3 = 7$

(6 marks)

Q5 (a) Air is being pumped into a spherical balloon at a rate of 4.5 m^3/ min. Find the rate of change of the radius when the radius is 2m.

(Volume of sphere = $\frac{4}{3}\pi r^3$)

(8 marks)

(b) Given the function of a curve is $f(x) = x^3 - 3x$.

(i) Find all the critical value of the function.

(ii) Fill up the **Table 1**

Table 1: Analysis table Q6 (b) (ii) *(copy this table into your answer booklet)

	Test value	Critical value	Test value	Critical value	Test value	Critical value	Test value
Value of x							
Value of $f(x)$							
Sign of $f'(x)$							
Gradient (increase/decrease)							
Sign of $f''(x)$							
Concave up/ concave down							
Shape of curve							

(iii) Sketch the graph of the curve and locate minima, maxima and inflection point.

(17 marks)

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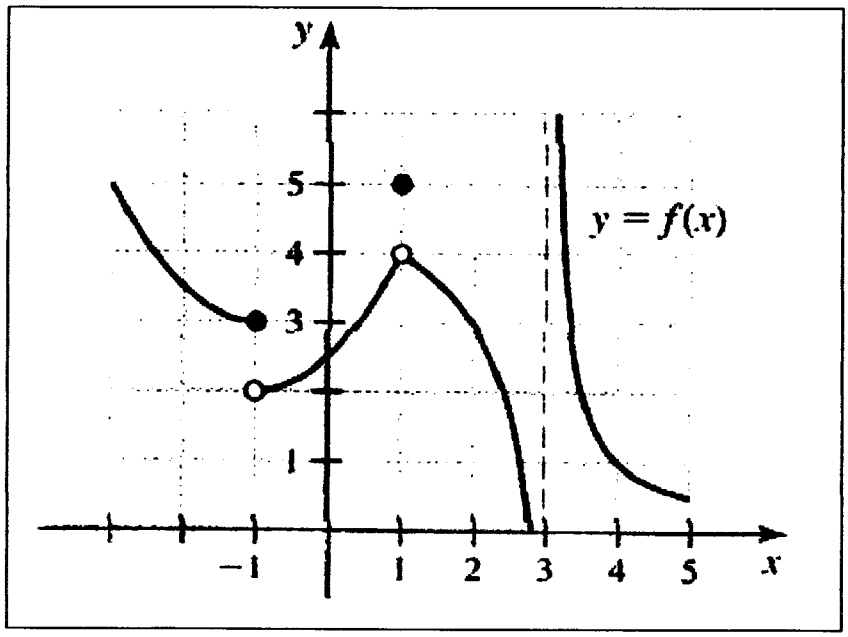

Diagram Q3 (a)

Differentiation:

$$\frac{d}{dx}x^n = nx^{n-1}$$

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$$

$$\frac{d}{dx}\ln u = \frac{1}{u}\cdot\frac{du}{dx}$$

$$\frac{d}{dx}e^u = e^u\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\sin u = \cos u\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\cos u = -\sin u\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\tan u = \sec^2 u\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\cot u = -\csc^2 u\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\sec u = \sec u\tan u\cdot\frac{du}{dx}$$

$$\frac{d}{dx}\csc u = -\csc u\cot u\cdot\frac{du}{dx}$$

Integration :

$$\int k\,dx = kx + C \qquad \int e^x dx = e^x + C$$

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C\,,(n \neq -1) \qquad \int \frac{1}{x} dx = \ln|x| + C$$

$$\int \sin x\,dx = -\cos x + C \qquad \int \cos x\,dx = \sin x + C$$

Area of region :

$$A = \int_a^b [f(x) - g(x)]\,dx \qquad \textbf{or} \qquad A = \int_c^d [w(y) - v(y)]\,dy$$

Volume cylindrical shells :

$$V = \int_a^b 2\pi x\, f(x)\,dx$$

$$V = \int_c^d 2\pi y\, f(y)\,dy$$