



**UTM**  
UNIVERSITI TEKNOLOGI MALAYSIA

Sekolah Pendidikan Profesional dan  
Pendidikan Berterusan  
(UTMSPACE)

**FINAL EXAMINATION / PEPERIKSAAN AKHIR  
SEMESTER 2 – SESSION 2014 / 2015  
PROGRAM KERJASAMA**

COURSE CODE : DDS 2042  
*KOD KURSUS*

COURSE NAME : MATHEMATICS IV  
*NAMA KURSUS MATEMATIK IV*

YEAR / PROGRAMME : 2 / DDC , DDZ  
*TAHUN / PROGRAM*

DURATION : 2 HOURS  
*TEMPOH 2 JAM*

DATE : APRIL 2015  
*TARIKH*

**INSTRUCTION :**  
*ARAHAN*

- ANSWER ALL (5) QUESTIONS.**  
*JAWAB SEMUA (5) SOALAN .*
- A LIST OF FORMULAE IS GIVEN ON THE LAST PAGE.**  
*SATU SENARAI RUMUS DIBERIKAN PADA MUKASURAT TERAKHIR.*

( You are required to write your name and your lecturer's name on your answer script )  
( *Pelajar dikehendaki tuliskan nama dan nama pensyarah pada skrip jawapan* )

NAME / NAMA PELAJAR	:	.....
I.C NO. / NO. K/PENGENALAN	:	.....
YEAR / COURSE TAHUN / KURSUS	:	.....
COLLEGE NAME NAMA KOLEJ	:	.....
LECTURER'S NAME NAMA PENSYARAH	:	.....

This examination paper consists of ...5... pages including the cover  
*Kertas soalan ini mengandungi ...5... muka surat termasuk kulit hadapan*

1. (a) Evaluate the following limits:  
*Nilaikan had-had yang berikut :*

(i)  $\lim_{x \rightarrow 5} \sqrt{\frac{2x-1}{x-1}}$

(ii)  $\lim_{x \rightarrow 1} \frac{x^3-x}{x-1}$

(iii)  $\lim_{x \rightarrow -3} \frac{|x^2+3x-2|}{x+2}$

(iv)  $\lim_{x \rightarrow \infty} \frac{6x^4-x^3+4}{2x^4}$

- (b) Find the derivative of  $f(x) = 3x^2$  using the First Principle method.  
Hence, evaluate  $f'(\frac{1}{3})$ .

*Dapatkan terbitan bagi  $f(x) = 3x^2$  menggunakan kaedah Perinsip Pertama.  
Seterusnya, nilaikan  $f'(\frac{1}{3})$ .*

(12M)

2. Differentiate the following functions:  
*Terbitkan fungsi - fungsi berikut:*

(a)  $y = \frac{1}{x^4}$

(b)  $y = x^2e^{-3x}$

(c)  $y = \frac{x}{x^2+5}$

(d)  $x^3y - 3xy^3 = 2$

(12M)

3. Using the second derivative test, determine the maximum, minimum, or an inflection point of the function  $f(x)$ , if exists. Sketch the graph  $f(x)$ .  
*Dengan menggunakan ujian terbitan kedua, tentukan titik maksimum, titik minimum atau titik lengkung balas bagi fungsi  $(x)$ , jika wujud. Lakarkan graf  $f(x)$ .*

$$f(x) = 2x^3 - 3x^2 - 12x$$

(12M)

4. Integrate the following functions:

*Kamirkan fungsi-fungsi berikut:*

(a)  $\int (4x^3 - 4x + 3) dx$

(b)  $\int \frac{2x}{(x^2-2)^3} dx$  ; by substitution method/kaedah gantian.

(c)  $\int \frac{x+4}{x^2+3x} dx$  ; by partial fractions /pecahan separa.

(d)  $\int x^2 e^{-x} dx$  ; by integration by parts/ bahagian demi bahagian.

(12M)

5. (a) Find the area of the region bounded by the graphs  $y = 3x - x^2$  and  $y = x$ . Sketch the graphs and shade the region enclosed.  
*Dapatkan luas rantau yang dibatasi oleh graf-graf  $y = 3x - x^2$  dan  $y = x$ . Lakarkan graf-graf tersebut dan lorekkan rantau yang dibatasi.*

- (b) Find the volume of the solid generated when the region in (a) is revolved about the x-axis.

*Dapatkan isipadu bongkah terjana apabila rantau dalam (a) dikisarkan pada paksi- x.*

(12M)

END OF QUESTION PAPER  
KERTAS SOALAN TAMAT

**Differentiation / Pembezaan**

$$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$\frac{d}{dx}(u^n) = nu^{n-1} \frac{du}{dx}$$

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

$$\frac{d}{dx}(a^u) = a^u \ln a \frac{du}{dx}$$

$$\frac{d}{dx}(\ln|u|) = \frac{1}{u} \frac{du}{dx}$$

$$\frac{d}{dx}(\log_a|u|) = \frac{1}{u \ln a} \frac{du}{dx}$$

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

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

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

$$\frac{d}{dx}(\cot u) = -\operatorname{cosec}^2 u \frac{du}{dx}$$

$$\frac{d}{dx}(\operatorname{sek} u) = \operatorname{sek} u \tan u \frac{du}{dx}$$

$$\frac{d}{dx}(\operatorname{kosek} u) = -\operatorname{kosek} u \cot u \frac{du}{dx}$$

$$\frac{d}{dx}(\sin^{-1} u) = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$$

$$\frac{d}{dx}(\cos^{-1} u) = -\frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$$

$$\frac{d}{dx}(\tan^{-1} u) = \frac{1}{1+u^2} \frac{du}{dx}$$

$$\frac{d}{dx}(\sinh u) = \cosh u \frac{du}{dx}$$

$$\frac{d}{dx}(\cosh u) = \sinh u \frac{du}{dx}$$

$$\frac{d}{dx}(\tanh u) = \operatorname{sech}^2 u \frac{du}{dx}$$

**Integration / Pengamiran**

$$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$$

$$\int u^n du = \frac{1}{n+1} u^{n+1} + c$$

$$\int \frac{1}{u} du = \ln|u| + c$$

$$\int e^u du = e^u + c$$

$$\int a^u du = \frac{1}{\ln a} a^u + c$$

$$\int \sin u du = -\cos u + c$$

$$\int \cos u du = \sin u + c$$

$$\int \sec^2 u du = \tan u + c$$

$$\int \operatorname{kosek}^2 u du = -\cot u + c$$

$$\int \operatorname{sek} u \tan u du = \operatorname{sek} u + c$$

$$\int \operatorname{kosek} u \cot u du = -\operatorname{kosek} u + c$$

$$\int \tan u du = \ln|\operatorname{sek} u| + c$$

$$\int \cot u du = \ln|\sin u| + c$$

$$\int \operatorname{sek} u du = \ln|\operatorname{sek} u + \tan u| + c$$

$$\int \operatorname{kosek} u du = \ln|\operatorname{kosek} u - \cot u| + c$$

$$\int \frac{1}{\sqrt{a^2 - u^2}} du = \sin^{-1} \frac{u}{a} + c$$

$$\int \frac{1}{a^2 + u^2} du = \frac{1}{a} \tan^{-1} \frac{u}{a} + c$$

**FIRST PRINCIPLE OF DERIVATIVE**

$$f'(x) = \lim_{\delta x \rightarrow 0} \frac{f(x + \delta x) - f(x)}{\delta x}$$

$$\lim_{\theta \rightarrow 0} \cos \theta = 1$$

$$\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$$

$$\lim_{\theta \rightarrow 0} \frac{\tan \theta}{\theta} = 1$$