UNIVERSITI SAINS MALAYSIA

Peperiksaan Kursus Semasa Cuti Panjang
Sidang Akademik 2006/2007

Jun 2007

MAA 101 – Calculus for Science Students I
[Kalkulus Untuk Pelajar Sains I]

Duration : 3 hours
[Masa : 3 jam]

Please check that this examination paper consists of FIVE pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi LIMA muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions : Answer **all eight** [8] questions.

[Arahan : *Jawab* ***semua lapan*** *[8] soalan.]*

...2/-

1. (a) Solve the inequality $x-1>x^2+x-2$.

(b) Two parallel lines, say line A and line B, are perpendicular to the line $8x+32y-4=0$. Line A passes through point (0,4) and line B passes through point (0,-4). Find the points where line A and line B intersect the x-axis.

[25 marks]

2. (a) Given $f(x)=\ln\left(\sqrt{x^2-9}\right)$ and $g(x)=\ln(x+3)$.

Find : (i) $f-g$ and its domain.

(ii) g^{-1} and its range.

(b) Find the horizontal and vertical asymptotes of the following curve:

$$y=\frac{x^2+4}{x^2-9}$$

[25 marks]

3. (a) Let $C(x)=\begin{cases} x+5 & x\leq 2 \\ x^2+3x-4 & x>2 \end{cases}$

Discuss whether the function is continuous at the point $x = 2$.

(b) (i) Find derivative of $D(x)=x^2-2x$ by definition.

(ii) Differentiate $E(x)=x^6\,e^{5\tan x}$

[25 marks]

4. (a) Find :

(i) $\lim\limits_{x\to -3}\dfrac{\frac{1}{3}-\frac{1}{x}}{3-x}$ (ii) $\lim\limits_{x\to 0}\dfrac{1-e^{-2x}}{\sin 4x}$

(b) A function is given by $f(x)=x^3-9x$.
Find the maximum and minimum points and the intervals of concavity

(c) Find the dimensions of a rectangle with parameter 100cm whose area is as large as possible.

[25 marks]

...3/-

1. (a) *Selesaikan ketaksamaan* $x-1>x^2+x-2$.

(b) *Dua garis lurus selari, katakan garis lurus A dan garis lurus B, adalah berserenjang dengan garis lurus* $8x+32y-4=0$. *Garis lurus A melalui titik* (0,4) *dan garis lurus B melalui titik* (0,-4). *Cari titik-titik di mana garis lurus A dan garis lurus B memotong paksi-x*

[25 markah]

2. (a) *Diberi* $f(x)=\ln\left(\sqrt{x^2-9}\right)$ *dan* $g(x)=\ln(x+3)$.

Cari: (i) $f-g$ *dan domainnya*

(ii) g^{-1} *dan julatnya*

(b) *Cari asimptot mendatar dan menegak bagi lengkung berikut:*

$$y=\frac{x^2+4}{x^2-9}$$

[25 markah]

3. (a) *Biar* $C(x)=\begin{cases} x+5 & x\le 2 \\ x^2+3x-4 & x>2 \end{cases}$

Bincang samada fungsi selanjar pada titik $x = 2$.

(b) *(i) Cari terbitan bagi* $D(x)=x^2-2x$ *dengan menggunakan takrif.*

(ii) Bezakan $E(x)=x^6\,e^{5\tan x}$

[25 markah]

4. (a) *Cari :*

(i) $\lim\limits_{x\to -3} \dfrac{\frac{1}{3}-\frac{1}{x}}{3-x}$ (ii) $\lim\limits_{x\to 0} \dfrac{1-e^{-2x}}{\sin 4x}$

(b) *Suatu fungsi diberi sebagai* $f(x)=x^3-9x$.
Cari titik-titk maksimum dan minimum dan selang kecengkungan.

(c) *Cari ukuran suatu segi empat dengan ukurlilit 100cm supaya luasnya adalah sebesar yang mungkin.*

[25 markah]

...4/-

5. (a) Find the derivative of $f(x)=\int_{2x}^{x} e^{(\sin t-t^2)}\,dt$.

(b) Use the Fundamental Theorem of Calculus part 2 to evaluate the following integral. If the integral does not exist, give your reason.

(i) $\int \frac{x^2+x-1}{\sqrt{x}}dx$

(ii) $\int_{-1}^{4} \frac{1}{\sqrt{x}}dx$

(iii) $\int_{0}^{2} |x-1|dx$

[30 marks]

6. (a) Find the area of the region bounded by the curves $y=x$ and $y=\sqrt{x}$.

(b) Find the volume of revolution when the region in (a) is rotated 360° about the line $y=2$.

[20 marks]

7. (a) By using a suitable substitution, evaluate the integral

$$\int_{1}^{2} \frac{3x^2-2x-6}{x(x+2)(x-3)}dx.$$

(b) Use the integration by parts technique to evaluate the integral $\int_{1}^{e} \ln x\,dx$.

[20 marks]

8. (a) Find the average value, f_{ave}, of $f(x)=x^2-3$ on the interval $[2,4]$. Then, find the number c such that $f_{ave}=f(c)$.

(b) Write out the form of the partial fraction decomposition of the expression below. **DO NOT** determine the numerical values of the coefficients.

$$\frac{2x+1}{(x+1)^3(x^2+x+1)(x^2+4)^2}$$

(c) Find the function f if it is given that $f''(x)=4-6x-20x^3$.

[30 marks]

...5/-

5. (a) *Cari terbitan* $f(x)=\int_{2x}^{x} e^{(\sin t-t^2)}\,dt$.

(b) *Gunakan Teorem Asas Kalkulus bahagian ke-2 untuk menilai kamiran berikut. Jika kamiran tidak wujud, berikan alasan anda.*

(i) $\int \frac{x^2+x-1}{\sqrt{x}}dx$

(ii) $\int_{-1}^{4} \frac{1}{\sqrt{x}}dx$

(iii) $\int_{0}^{2} |x-1|dx$

[30 markah]

6. (a) *Cari luas rantau yang dibatasi oleh lengkungan* $y=x$ *and* $y=\sqrt{x}$.

(b) *Cari isipadu kisaran apabila rantau dalam (a) dikisarkan* $360°$ *terhadap garis* $y=2$.

[20 markah]

7. (a) *Dengan menggunakan gantian yang sesuai, cari nilai bagi kamiran*

$$\int_{1}^{2} \frac{3x^2-2x-6}{x(x+2)(x-3)}dx.$$

(b) *Gunakan teknik pengamiran bahagian demi bahagian untuk menilai kamiran* $\int_{1}^{e} \ln x\,dx$.

[20 markah]

8. (a) *Cari nilai purata,* f_{ave}, *untuk* $f(x)=x^2-3$ *pada selang* $[2,4]$. *Kemudian, cari nombor c sedemikian* $f_{ave}=f(c)$.

(b) *Tuliskan bentuk pecahan separa untuk ungkapan di bawah. JANGAN cari nilai berangka untuk pekali.*

$$\frac{2x+1}{(x+1)^3(x^2+x+1)(x^2+4)^2}$$

(c) *Cari fungsi* f *jika diberi* $f''(x)=4-6x-20x^3$.

[30 markah]

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