UNIVERSITI SAINS MALAYSIA

Peperiksaan Kursus Semasa Cuti Panjang
Sidang Akademik 2008/2009

Jun 2009

MAA 102 – Calculus for Science Students II
[Kalkulus untuk Pelajar Sains II]

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 ten** [10] questions.

[Arahan : *Jawab* ***semua sepuluh*** *[10] soalan.]*

...2/-

1. Determine whether the sequence $\left\{ n+\frac{1}{n} \right\}$ is monotonic and bounded.

[5 marks]

2. Test the convergence of the series:

(a) $\sum_{n=1}^{\infty} \frac{(n+1)(n^2-1)}{4n^3-2n+1}$ (b) $\sum_{n=1}^{\infty} \frac{(-2)^n}{n^n}$

[10 marks]

3. (a) Find the radius and interval of convergence of the power series $\sum_{n=1}^{\infty} \frac{x^n}{5^n n^5}$.

(b) Find the Maclaurin series for $\sin x$. Hence, compute $\sin 3^\circ$ correct to five decimal places.

[15 marks]

4. Determine whether the integral $\int_1^{33} (x-1)^{-1/5}\, dx$ is convergent or divergent.

[5 marks]

5. If $f(x,y) = x^2 y e^y$, find $f_{xy} - f_{yx}$.

[5 marks]

6. Suppose f is a differentiable function of x and y, and $g(r,s) = f(2r-s, s^2-4r)$. Use the table of values to calculate $g_r(1,2)$ and $g_s(1,2)$.

	f	g	f_x	f_y
(0, 0)	3	6	4	8
(1, 2)	6	3	2	5

[8 marks]

...3/-

1. *Tentukan sama ada jujukan* $\left\{ n+\frac{1}{n} \right\}$ *monotonik dan terbatas.*

[5 markah]

2. *Uji penumpuan siri:*

(a) $\sum_{n=1}^{\infty} \frac{(n+1)(n^2-1)}{4n^3-2n+1}$ (b) $\sum_{n=1}^{\infty} \frac{(-2)^n}{n^n}$

[10 markah]

3. (a) *Dapatkan jejari dan selang penumpuan bagi siri kuasa* $\sum_{n=1}^{\infty} \frac{x^n}{5^n n^5}$.

(b) *Dapatkan siri Maclaurin bagi sin x. Seterusnya, hitung sin x betul kepada lima titik perpuluhan.*

[15 markah]

4. *Tentukan sama ada kamiran* $\int_1^{33} (x-1)^{-1/5}\, dx$ *menumpu atau mencapah.*

[5 markah]

5. *Jika* $f(x,y)=x^2ye^y$, *dapatkan* $f_{xy}-f_{yx}$.

[5 markah]

6. *Andaikan f fungsi x dan y yang terbezakan dan* $g(r,s)=f(2r-s,s^2-4r)$. *Menggunakan jadual nilai, hitung* $g_r(1,2)$ *dan* $g_s(1,2)$.

	f	g	f_x	f_y
(0, 0)	3	6	4	8
(1, 2)	6	3	2	5

[8 markah]

7. Find the maximum rate of change of $f(x,y)=x^4y-x^2y^3$ at $\mathrm{P}(2,-3)$ and the direction in which it occurs.

[8 marks]

8. Find three positive numbers whose sum is 100 and whose product is a maximum.

[12 marks]

9. Evaluate the integrals.

(a) $\int_0^1 \int_0^{\sqrt{1-x^2}} \cos\left(x^2+y^2\right) dydx$

(b) $\iint_D x^3y^2\,dA,\ D=\{(x,y)\,|\,0\le x\le 2,-x\le y\le x\}$

[12 marks]

10. (a) Find the integrating factor for the differential equation $x\frac{dy}{dx}-2y=2x^3$, $x>0$. Hence, find the particular solution when $y(3)=0$.

(b) A thermometer is taken from the room where the temperature is $20^{\circ}C$ to the outdoors, where the temperature is $5^{\circ}C$. After one minute the thermometer reads $12^{\circ}C$. What will the reading on the thermometer be after one more minute?

[20 marks]

7. *Dapatkan kadar perubahan maksimun bagi* $f(x,y)=x^4y-x^2y^3$ *pada* $\mathrm{P}(2,-3)$ *dan arah ianya berlaku.*

[8 markah]

8. *Dapatkan tiga nombor positif yang jumlahnya 100 dan hasildarabnya adalah maksimum.*

[12 markah]

9. *Nilaikan kamiran.*

(a) $\int_0^1 \int_0^{\sqrt{1-x^2}} \cos\left(x^2+y^2\right) dydx$

(b) $\iint_D x^3y^2\,dA,\ D=\{(x,y)\,|\,0\le x\le 2,-x\le y\le x\}$

[12 markah]

10. (a) *Dapatkan faktor pengamir bagi persamaan pembezaan* $x\frac{dy}{dx}-2y=x^3$, $x>0$. *Seterusnya, dapatkan penyelesaian khusus bila* $y(3)=0$.

(b) *Suatu termometer di bilik bersuhu* $20^\circ C$ *dibawa keluar rumah yang suhunya* $5^\circ C$. *Selepas satu minit, bacaan termometer adalah* $12^\circ C$. *Apakah bacaan termometer selepas satu minit lagi?*

[20 markah]

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