
UNIVERSITI SAINS MALAYSIA

First Semester Examination
2013/2014 Academic Session

Januari 2014

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 ___ pages of printed materials before you begin the examination.

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

Instructions: Answer **all nine** [9] questions.

Arahan: Jawab **semua sembilan** [9] soalan.]

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai].

1. Solve $0 < |x-3| < \frac{3}{2}$. [7 marks]

1. *Selesaikan* $0 < |x-3| < \frac{3}{2}$. [7 markah]

2. Let $f(x) = \begin{cases} \frac{x^2-9}{x+3} & , x \neq -3 \\ k & , x = -3 \end{cases}$. Find the value of k so that f is continuous everywhere. [6 marks]

2. *Biar* $f(x) = \begin{cases} \frac{x^2-9}{x+3} & , x \neq -3 \\ k & , x = -3 \end{cases}$. *Dapatkan nilai k sedemikian f selanjur di mana-mana.* [6 markah]

3. Evaluate, if the limit exists.

(a) $\lim_{x \rightarrow 2} \frac{x}{x^2 - 4}$

(b) $\lim_{x \rightarrow 0} \frac{\sin x - x}{x^3}$

(c) $\lim_{x \rightarrow \infty} (\sqrt{x^2 + x} - \sqrt{x^2 - x})$ [14 marks]

3. *Nilaikan, jika limit wujud.*

(a) *had* $\frac{x}{x^2 - 4}$

(b) *had* $\frac{\sin x - x}{x^3}$

(c) *had* $\left(\sqrt{x^2 + x} - \sqrt{x^2 - x} \right)$ [14 markah]

4. Let $f(x) = \frac{x-2}{x+2}$. Find x if $f^{-1}(x) = 3$. [6 marks]

4. Biar $f(x) = \frac{x-2}{x+2}$. Dapatkan x jika $f^{-1}(x) = 3$. [6 markah]

5. Find $\frac{dy}{dx}$.

(a) $x^4 + \cos y = xe^{2y}$.

(b) $y = (\sin x)^x$.

(c) $y = 2 - \int_{-1}^{x+1} \frac{9}{1+t^2} dt$. [14 marks]

5. Dapatkan $\frac{dy}{dx}$.

(a) $x^4 + \cos y = xe^{2y}$.

(b) $y = (\sin x)^x$.

(c) $y = 2 - \int_{-1}^{x+1} \frac{9}{1+t^2} dt$. [14 markah]

6. Show that the equation $x^2 + \sqrt{2x+5} = 4$ has at least one solution. [4 marks]

6. Tunjukkan bahawa persamaan $x^2 + \sqrt{2x+5} = 4$ mempunyai sekurang-kurangnya satu penyelesaian. [4 markah]

7. Let $f(x) = x^{2/3}(x-5)$. Find,

- (a) the intervals on which f is increasing or decreasing.
- (b) the local maximum and minimum value of f , if any.
- (c) the intervals of concavity and inflection points, if exists.

Hence, sketch the graph of f .

[18 marks]

7. Biar $f(x) = x^{2/3}(x-5)$. Dapatkan,

- (a) selang yang mana f adalah menokok atau menyusut.
- (b) nilai maksimum dan minimum tempatan bagi f , jika ada.
- (c) selang kecekungan dan titik lengkok balas, jika wujud.

Seterusnya, lakarkan graf bagi f .

[18 markah]

8. Evaluate the integrals.

(a) $\int_0^{\pi/2} \sin^2 2\theta \cos^3 2\theta d\theta$

(b) $\int \ln(x+x^2) dx$

(c) $\int \frac{x}{x^2-2x-3} dx$

[20 marks]

8. Nilai kamiran.

(a) $\int_0^{\pi/2} \sin^2 2\theta \cos^3 2\theta d\theta$

(b) $\int \ln(x+x^2) dx$

(c) $\int \frac{x}{x^2-2x-3} dx$

[20 markah]

9. Set up, but do not evaluate the integral for

- (a) the volume of the solid obtained by rotating the region in the first quadrant bounded by the curve $y = e^x - 1$, the x -axis and the line $x = \ln 2$ about the line $x = \ln 2$.
- (b) the area of the surface obtained by rotating the curve $x = 2\sqrt{4 - y}$, $0 \leq y \leq 15/4$ about the y -axis.
- (c) the length of the curve $y = \frac{x^2}{2} - \frac{\ln x}{4}$ from $x = 1$ to $x = 3$.

[11 marks]

9. Nyatakan kamiran, tanpa menilaikannya bagi

- (a) isipadu pepejal yang dihasilkan dengan memutar rantau dalam sukuan pertama yang dibatasi oleh lengkung $y = e^x - 1$, paksi- x dan garis $x = \ln 2$ sekitar garis $x = \ln 2$.
- (b) luas permukaan yang dihasilkan dengan memutar lengkung $x = 2\sqrt{4 - y}$, $0 \leq y \leq 15/4$ sekitar paksi- y .
- (c) panjang lengkung $y = \frac{x^2}{2} - \frac{\ln x}{4}$ dari $x = 1$ ke $x = 3$.

[11 markah]