
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
2016/2017 Academic Year

June 2017

MAA 101 - Calculus For Science Students
[Kalkulus Untuk Pelajar Sains]

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 **SEVEN** (7) questions.

[Arahan: Jawab **TUJUH** (7) 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. Find the limit of the following functions.

(a) $f(x) = \frac{2x \sin x}{1 - \cos x}$ when $x \rightarrow 0$.

(b) $g(x) = \frac{|4x-12|}{x-3}$ when $x \rightarrow 3^-$.

(c) $h(x) = \sqrt{x^2 + x} - x$ when $x \rightarrow \infty$.

[8 marks]

1. Dapatkan had bagi fungsi yang berikut.

(a) $f(x) = \frac{2x \sin x}{1 - \cos x}$ apabila $x \rightarrow 0$.

(b) $g(x) = \frac{|4x-12|}{x-3}$ apabila $x \rightarrow 3^-$.

(c) $h(x) = \sqrt{x^2 + x} - x$ apabila $x \rightarrow \infty$.

[8 markah]

2. Let $f(x) = \frac{4x+3}{x+2}$.

(a) Show that f is a one to one function. Hence, find $f^{-1}(-2)$, the domain and the range of f^{-1} .

(b) Solve $|f(x)| \leq x$.

(c) Find the derivative of f using the definition of derivative. Hence, find an equation of the tangent line at the point $(1, \frac{7}{3})$.

[17 marks]

2. Biar $f(x) = \frac{4x+3}{x+2}$.

(a) Tunjukkan bahawa f adalah fungsi satu dengan satu. Seterusnya, dapatkan $f^{-1}(-2)$, domain dan julat bagi f^{-1} .

(b) Selesaikan $|f(x)| \leq x$.

(c) Dapatkan terbitan bagi f menggunakan definisi terbitan. Seterusnya, dapatkan persamaan garis tangen pada titik $(1, \frac{7}{3})$.

[17 markah]
...3/-

3. Find $\frac{dy}{dx}$ for the following functions.

(a) $y = x^{e^x}$.

(b) $y^3 - x \cos y + \frac{y^2}{x} = 8$.

(c) $y = x \int_e^{x^2} \sin t^3 dt$.

[14 marks]

3. Dapatkan $\frac{dy}{dx}$ bagi fungsi yang berikut.

(a) $y = x^{e^x}$.

(b) $y^3 - x \cos y + \frac{y^2}{x} = 8$.

(c) $y = x \int_e^{x^2} \sin t^3 dt$.

[14 markah]

4. Let $f(x) = x^4 - 2ax^2 + b$, where a and b are positive integers. Find,

(a) all the critical points and inflection points of f .

(b) the values of a and b if f has a critical point at $(2, 5)$. Hence, what are the inflection points for f ?

(c) the intervals of concavity of f .

Hence, sketch the graph of f for $-3 \leq x \leq 3$.

[15 marks]

4. Biar $f(x) = x^4 - 2ax^2 + b$, yang mana a dan b adalah integer positif. Dapatkan,

(a) kesemua titik genting dan titik lengkok balas bagi f .

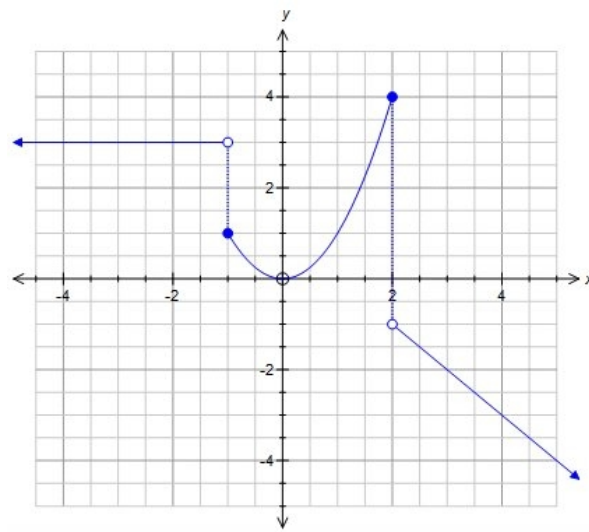
(b) nilai-nilai bagi a dan b jika f mempunyai titik genting pada $(2, 5)$. Dengan itu, apakah titik lengkok balas bagi f ?

(c) selang kecekungan bagi f .

Seterusnya, lakarkan graf bagi f untuk $-3 \leq x \leq 3$.

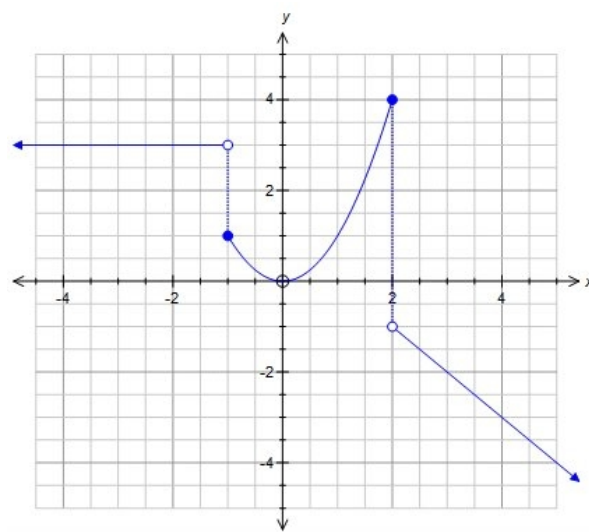
[15 markah]

5. Write down a piecewise function for the graph below.



[6 marks]

5. Tuliskan fungsi cebis demi cebis bagi graf di bawah.



[6 markah]

...5/-

6. Evaluate the following integrals.

(a) $\int \frac{\ln(3x)}{x} dx.$

(b) $\int \frac{x^3+x^2+7}{x^2+x-2} dx.$

(c) $\int_0^1 x^2 e^{-x} dx.$

[20 marks]

6. *Nilaikan kamiran berikut.*

(a) $\int \frac{\ln(3x)}{x} dx.$

(b) $\int \frac{x^3+x^2+7}{x^2+x-2} dx.$

(c) $\int_0^1 x^2 e^{-x} dx.$

[20 markah]

7. (a) Sketch the region R bounded by $y = x^2 + 3$, x -axis, $x = 1$ and $x = 2$.
Find,

(i) the area of the region R .

(ii) the volume of the solid obtained by rotating the region R about the line $y = 7$.

(b) Find the surface area obtained by rotating the curve $x = \sqrt{4y - y^2}$, $1 \leq y \leq 2$ about the y -axis.

[20 marks]

7. (a) *Lakarkan rantau R yang dibatasi oleh $y = x^2 + 3$, paksi- x , $x = 1$ dan $x = 2$.
Dapatkan,*

(i) *luas rantau R .*

(ii) *isipadu pepejal yang dihasilkan dengan memutar rantau R sekitar garis $y = 7$.*

(b) *Dapatkan luas permukaan yang terhasil dengan memutar lengkung $x = \sqrt{4y - y^2}$, $1 \leq y \leq 2$ sekitar paksi- y .*

[20 markah]