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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019**

COURSE NAME : MATHEMATICS II
COURSE CODE : BBM 10403
PROGRAMME CODE : BBA/ BBB/ BBD/ BBG/BBF
EXAMINATION DATE : DECEMBER 2018/ JANUARY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWERS ALL QUESTIONS

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THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

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Q1 (a) Given function, $f(x) = \begin{cases} -2x - 4; & x < -2 \\ x^2 + 4; & -2 \leq x < 1 \\ 2; & x \geq 1 \end{cases}$

(i) Sketch the graph of $f(x)$ (4 marks)

(ii) Determine the domain and range of $f(x)$ (2 marks)

(b) Based on the graph S1(a),

(i) Find the limits of $f(x)$ at $x = 1$ (1 marks)

(ii) Specify $f(x)$ at $x = 1$ continuous or not (1 marks)

(c) Given $f(x) = 2x + 4$, and $f \circ g(x) = 3x - 8$

(i) Find the function of g (5 marks)

(ii) Determine $g \circ f$ (2 marks)

(d) Given that $f^{-1}(x) = \frac{2x+1}{2x-1}, x \neq \frac{1}{2}$, find $f(x)$.

(5 marks)

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Q2 (a) Compute the limits of the following functions:

(i) $\lim_{x \rightarrow +\infty} \frac{3x^2 + 5x - 7}{2x^2 - 3x + 1}$

(2 marks)

(ii) $\lim_{x \rightarrow -\infty} \sqrt{\frac{2 + 3x}{x - 1}}$

(2 marks)

(iii) $\lim_{x \rightarrow 0} \frac{e^x - x - 1}{x^2}$. Use L'Hopital Rule twice.

(3 marks)

(iv) $\lim_{x \rightarrow +\infty} \frac{x}{(\ln x)^3}$. Use L'Hopital Rule thrice.

(4 marks)

(v) $\lim_{x \rightarrow 2} \frac{\sqrt{x+7} - 3}{x - 2}$

(3 marks)

(b) Solve the following:

(i) Find $\lim_{x \rightarrow 0} f(x)$, also check the continuity

$$f(x) = \begin{cases} x + 2, & x < 0 \\ 0 & x = 0 \\ 2x + 2, & x > 0 \end{cases}$$

(3 marks)

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- (ii) Let the function $f(x)$ be defined for all values of x by

$$f(x) = \begin{cases} x^2 - 1, & x \geq 0 \\ -x^2 + 1, & x < 0 \end{cases}$$

Sketch the graph of the function $f(x)$ and test the continuity from the graph.

(3 marks)

Q3

- (a) Find $\frac{dy}{dx}$ for the following function

(i) $y = 2x^2 \ln x$

(3 marks)

(ii) $y = e^{f(x)}$

(3 marks)

(iii) $y = \sin^3(2x + 3)$

(3 marks)

- (b) Find the slope of the tangent line to the curve $3xy - 2x^2 = 7$ at $(1, 3)$. Then, compute the second derivative.

(5 marks)

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(c) Solve the following related rates:

- (i) Suppose an object is moving along a path described by $y = x^2$, that is, it is moving on a parabolic path. At a particular time, say $t = 5$, the x coordinate is 6 and we measure the speed at which the x coordinate of the object is changing and find that $\frac{dx}{dt} = 3$. At the same time, how fast is the y coordinate changing?

(3 marks)

- (ii) You are inflating a spherical balloon at the rate of $7\text{cm}^3/\text{sec}$. How fast is its radius increasing when the radius is 4 cm?

(3 marks)

Q4 (a) Find

(i)

$$\int \left[2x^3 + \frac{3}{x^2} - \frac{1}{x} \right] dx.$$

(3 marks)

(ii)

$$\int_1^2 (x+2)(x+3) dx$$

(3 marks)

(b) Solve $\int (x+1)^5$ by using integration by substitution method

(2 marks)

(c) Solve $\int \ln x dx$ by using integration by parts method

(3 marks)

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(d) In Diagram Q4(d), the straight line WY is normal to the curve of $y = \frac{1}{2}x^2 + 1$ at B (2, 4). The straight line BQ is parallel to the y-axis.

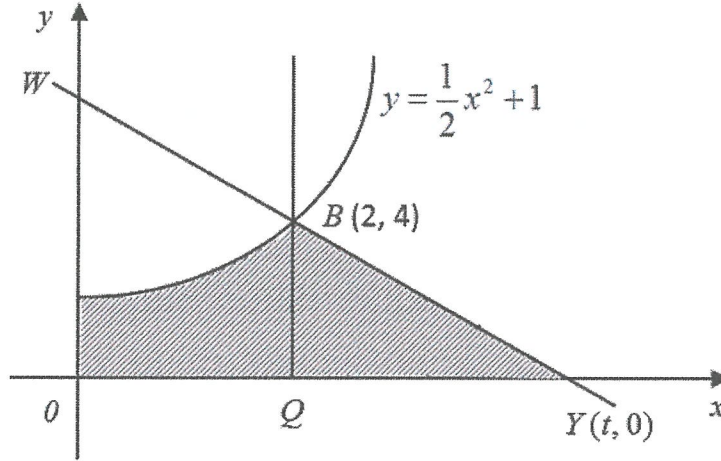


Diagram Q4(d)

Find

- (i) the value of t , (3 marks)

- (ii) the area of the shaded region, (3 marks)

- (iii) the volume generated, in terms of p , when the region bounded by the curve, the y -axis and the straight line $y = 4$ is revolved through 360° about the y -axis. (3 marks)

- S5 (a) The third term of an arithmetic sequence is 10 and the sixth term is 22 respectively,
- (i) find the common difference and the first term (4 marks)

 - (ii) calculate the 10th (2 marks)

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- (b) The first term of a finite geometric series is 6 and the last term is 4374. The sum of all the terms is 6558. Find the common ratio of the series

(8 marks)

- (c) The value of a new motorcycle is RM4500 and it depreciates by 10% each year. Find the value of these vehicles when it is five years old

(6 marks)

-END OF QUESTIONS-

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