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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

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

COURSE NAME : MATHEMATICS II
COURSE CODE : BBP 10403
PROGRAMME CODE : BBA/ BBB/ BBD/ BBG/BBF
EXAMINATION DATE : JUNE / JULY 2019
DURATION : 3 HOURS
INSTRUCTION : ANSWERS ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

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TERBUKA

Q1 (a) For the piecewise-defined function $f(x) = \begin{cases} 1 & x < 0 \\ 2-x & 0 \leq x < 2 \\ \sqrt{x-2} & x \geq 2 \end{cases}$

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

(ii) At what values of x is f discontinuous? (2 marks)

(b) For the piecewise-defined function defined by $f(x) = \begin{cases} x^2 + 1, & x < 2 \\ -x + 3, & x \geq 2 \end{cases}$. Sketch the graph of, find the domain and range. (5 marks)

(c) Solve the following:

(i) If $f(x) = -x^2 - 2x - 1$, find $f(-3)$ (2 marks)

(ii) For $f(x) = 2x - 2$ and $g(x) = -x^2 + 1$, find the composite function defined by $(f \circ g)(x)$. (2 marks)

(iii) Find the function $f \circ g(1)$ given that $f(x) = 3x + 2$ and $g(x) = \sqrt{2x + 5}$ (2 marks)

(d) For each of the following pairs of functions, state whether they are inverses of each other.

(i) $f(x) = \frac{x+1}{2}$, $g(x) = 2x - 1$ (4 marks)

(ii) $f(x) = \frac{x-1}{2}$, $g(x) = 2(x+1)$ (4 marks)

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

(i) $\lim_{x \rightarrow \infty} \frac{3x^5 - 7x^2 + 9}{6x^5 - 2x^4 - 10}$.

(3 marks)

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

(3 marks)

(iii) $\lim_{x \rightarrow \infty} \frac{4x^2 - 3x + 6}{5 + 2x - 3x^2}$. Use L'Hopital Rule to solve it.

(4 marks)

(iv) $\lim_{x \rightarrow 4} \frac{\sqrt{5x-11} - 3}{\sqrt{x} - 2}$. Use L'Hopital Rule to solve it.

(4 marks)

(b) Sketch the graph for $f(x) = \frac{1}{\sqrt{2-x}}$. Hence, determine the value of x at which the function is continuous.

(5 marks)

(c) Evaluate the following limits if they exist, based on the graph in Diagram Q2(c) below:

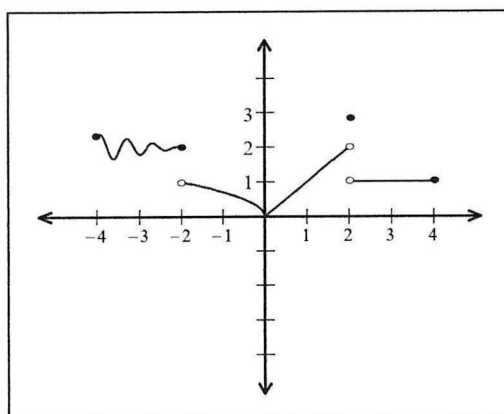


Diagram Q2(c)

(i) $\lim_{x \rightarrow 2^-} f(x)$

(2 marks)

(ii) $\lim_{x \rightarrow -2^+} x^2 f(x)$

(2 marks)

(iii) $\lim_{x \rightarrow 0} f(x)$

(2 marks)

Q3

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

(i) $f(x) = \frac{3x^2 - 5}{\sqrt{x}}$

(3 marks)

(ii) $f(x) = 3 \ln x + 10$

(3 marks)

(iii) $f(x) = e^x + e^{5x}$

(3 marks)

(iv) $3y^2 - 5xy + 9x - 2 = 0$

(3 marks)

(b) Given that $f(x) = (3 - 2x^2)^5$, find $f''(x)$. Hence, determine the value of $f''(1)$

(4 marks)

(c) Solve the following related rates:

(i) Given that $y = 3x^2 - 2x$ and x is increasing at a constant rate of 2 unit per second, find the rate of change of y when $x = 4$ unit.

(4 marks)

(ii) The area of a circle of radius r cm increases at a constant rate of 10 cm² per second. Find the rate of change of r when $r = 2$ cm. (Use $\pi = 3.142$)

(5 marks)

Q4 (a) Find

(i) $\int (5x - 2)^2 dx$

(3 marks)

(ii)

$$\int_{-2}^2 (s^3 - 3s^2 + 2) ds$$

(3 marks)

(b) Solve $\int \cos(3x + 2) dx$ by using integration by substitution method

(4 marks)

(c) Solve $\int x^4 e^x dx$ by using integration by parts method

(5 marks)

(d) Evaluate $\int \frac{1}{(x-1)^2(x+1)} dx$ using partial fraction.

(5 marks)

- (e) Diagram Q4 (d) shows a curve $x = y^2 - 1$ that intersects the straight line $3y = 2x$ at point Q. Calculate the volume of the shaded region when the shaded region is circled through the 360 on the y-axis.

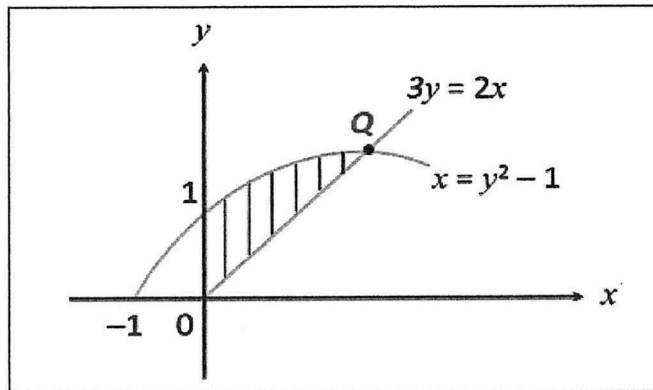


Diagram Q4(d)

(5 marks)

-END OF QUESTIONS-