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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020**

COURSE NAME : MATHEMATICS II
COURSE CODE : BBP 10403
PROGRAMME CODE : BBA/ BBB/ BBD/ BBE/BBG
EXAMINATION DATE : JULY 2020
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

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Q1 (a)

For the piecewise-defined function $g(x) = \begin{cases} -1, & x \leq -1 \\ 1, & -1 < x \leq 1 \\ x, & x > 1 \end{cases}$

(i) Graph the function $f(x)$

(2 marks)

(ii) Find the domain and range

(2 marks)

(b) Based on the limits given:

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

(3 marks)

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

(3 marks)

(iii) Solve the equations $\lim_{x \rightarrow 2} \frac{\sqrt{x+7} - 3}{x - 2}$.

(3 marks)

(c) Solve the following:

(i) Given that $y = x^3 \sin x$, find $\frac{dy}{dx}$

(3 marks)

(ii) Find the derivative of the function $f(x) = x^2 \sqrt{x^2 + 1}$.

(3 marks)

(d) Solve the following:

(i) Evaluate $\int_{-1}^3 \pi(3x - 4)^2 dx$.

(2 marks)

(ii) Using Figure Q1(d), find the area of the region enclosed by the curve, the y axis and the lines given.

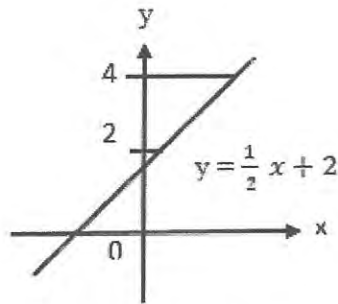


Figure Q1(d)

(4 marks)

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Q2 (a) Solve the following:

(i) If $f(x) = -9x - 9$ and $g(x) = \sqrt{x - 9}$, find $(f \circ g)(10)$.

(2 marks)

(ii) Given $f(x) = x - 1$ and $g(x) = x^2 + 2x - 8$, find $(g \circ f)(x)$.

(2 marks)

(b) Using the graph in Figure Q2(b), find the following left- and right-hand limits

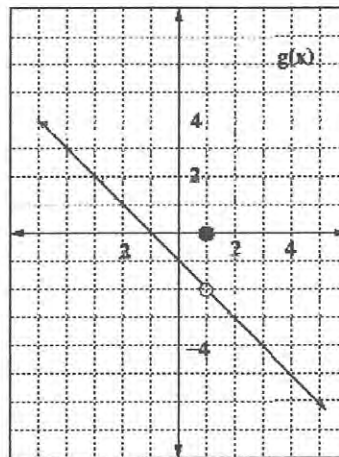


Figure Q2(b)

(i) $\lim_{x \rightarrow 0^-} g(x)$.

(1 mark)

(ii) $\lim_{x \rightarrow 0^+} g(x)$.

(1 mark)

(iii) $\lim_{x \rightarrow 1^-} g(x)$.

(1 mark)

(iv) $\lim_{x \rightarrow 1^+} g(x)$.

(1 mark)

(c) Solve the following:

(i) Find y' for $x^3y^5 + 3x = 8y^3 + 1$ using implicit differentiation. (4 marks)

(ii) A ball is thrown upward so that its height above the ground after time t is $h = 20t - 5t^2$, where h is measured in meters and t is measured in seconds. Determine the equation that represents the velocity of the ball. Then, determine when the ball reaches its maximum height. (4 marks)

(d) (i) Indefinite integral is an integral expressed without limits, and so containing an arbitrary constant

Find $\int \frac{10}{(1-10x)^2} dx$. (2 marks)

(ii) Find $\int_0^3 (3x^2 - 2x) dx$ by integration. (3 marks)

(iii) Using Figure Q2(d), find the area of the region enclosed by the curve, the y -axis and the lines given.

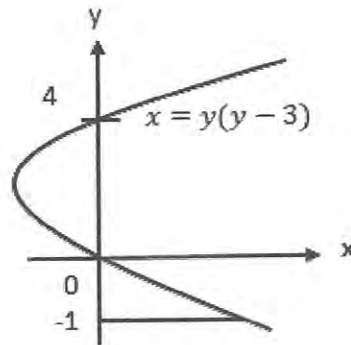


Figure Q2(d)

(4 marks)

Q3 (a) Show that each of the following functions are inverses by showing that $f(g(x)) = x$.

(i) $f(x) = x^2 - 4$; $g(x) = \sqrt{x + 4}$ (2 marks)

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

(iii) $f(x) = 2x + 3$; $g(x) = \frac{x - 3}{2}$ (2 marks)

(b) Using the graph in Figure Q3(b), find the following limits.

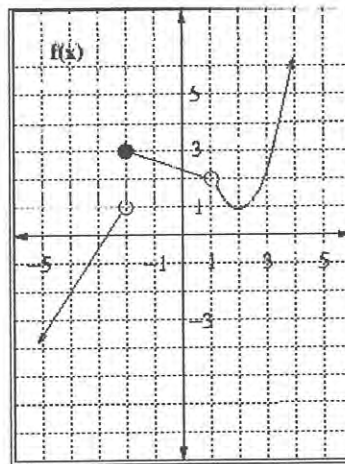


Figure Q3(b)

(i) $\lim_{x \rightarrow 1} f(x)$ (2 marks)

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



(c) Solve the following equation.

(i) Given $y = \frac{\sin x}{1 + \cos x}$, $-\pi < x < \pi$, find $\frac{dy}{dx}$.

(3 marks)

(ii) Given $y = \frac{x}{\sqrt{x+4}}$, $x > -4$, find $\frac{dy}{dx}$.

(3 marks)

(d) (i) Evaluate $\int x e^x dx$ using integration by parts.

(3 marks)

(ii) Find $\int \frac{3x - 1}{x^2 - x - 6} dx$ using integration by partial fractions.

(3 marks)

(iii) Using substitution method, evaluate $f(x) = (x^2 + 1)^3$.

(3 marks)

- END OF QUESTION -