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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION  
(ONLINE)  
SEMESTER II  
SESSION 2020/2021**

COURSE NAME : MATHEMATICS II  
COURSE CODE : BBP 10403  
PROGRAMME CODE : BBA/ BBB/ BBD/ BBE/BBG  
EXAMINATION DATE : ~~JUNE~~ 2021  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF TEN (10) PAGES

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- Q1 (a) A cell phone company uses the function below to determine the cost,  $C$ , in Ringgit Malaysia for  $g$  gigabytes of data transfer.

$$C(g) = \begin{cases} 25 & \text{if } 0 < g < 2 \\ 25 + 10(g - 2) & \text{if } g \geq 2 \end{cases}$$

- i) Find the cost of using 1.5 gigabytes of data  
(2 marks)
- ii) Find the cost of using 4 gigabytes of data.  
(2 marks)
- (b) Based on the limits given:
- i) Find  $\lim_{x \rightarrow 1} \left( \frac{1}{\ln x} - \frac{1}{x-1} \right)$ . Use L'Hopital Rule to solve it.  
(3 marks)
- ii) Find  $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$ . Use L'Hopital Rule to solve it.  
(3 marks)
- iii) Solve  $\lim_{x \rightarrow -\infty} \frac{3x-1}{x^2+1} =$   
(3 marks)
- (c)
- i) Given that  $f(x) = (3x+1)^5$ . Find the value of  $f'(-1)$ .  
(3 marks)
- ii) It is given that  $y = \frac{2}{3}u^7$ , where  $u = 3x-5$ . Find  $\frac{dy}{dx}$  in terms of  $x$ .  
(3 marks)
- (d) i) Evaluate  $\int x^{\frac{4}{5}} dx$ .  
(2 marks)

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

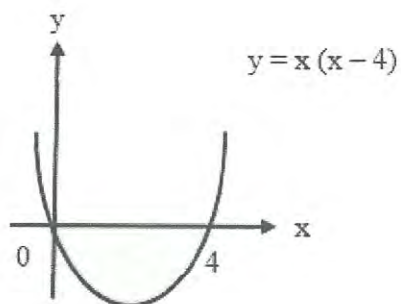


Diagram Q1(d)

(4 marks)

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Q2 (a) Given the function  $k(t) = t^3 + 2$

i) Evaluate  $k(2)$ .

(2 marks)

ii) Solve  $k(t) = 1$ .

(2 marks)

(b) Using the graph in Diagram Q2(b), find the following limits.

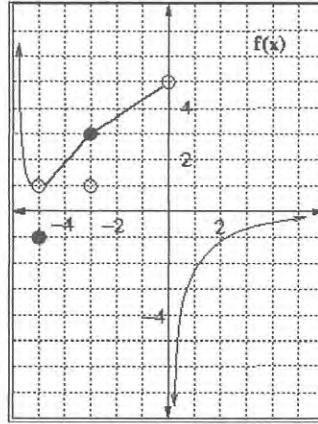


Diagram Q2(b)

i)  $\lim_{x \rightarrow -5} f(x)$ .

(1 marks)

ii)  $\lim_{x \rightarrow -\infty} f(x)$ .

(1 marks)

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

(1 marks)

iv)  $\lim_{x \rightarrow \infty} f(x)$ .

(1 marks)

(c) Solve the following:

i) Find  $\frac{d}{dx} \left( \frac{1}{5x-3} \right)$ .

(2 marks)

ii) The point  $P$  lies on the curve  $y = (x - 5)^2$ . It is given that the gradient of the normal at  $P$  is  $-\frac{1}{4}$ . Find the coordinates of  $P$ .

(3 marks)

iii) Given that  $r$  cm is the radius of a sphere. Calculate the approximate change in its area when the radius increases from 8 cm to 8.002 cm.

(3 marks)

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

Find  $\int (-6x^3 + 9x^2 + 4x - 3) dx$

(2 marks)

- ii) Find  $\int_{-2}^2 (s^3 - 3s^2 + 2) ds$  by integration.

(3 marks)

- iii) Find the area of shaded region for the diagrams **Q2(d)**

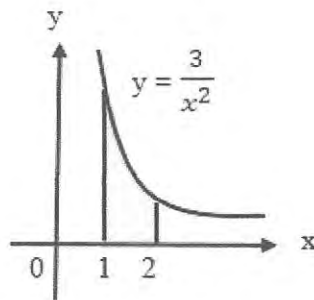


Diagram **Q2(d)**

(4 marks)

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Q3 (a) Find the algebraic inverse.

i)  $f(x) = \frac{1}{3}x + 7$

(2 marks)

ii)  $f(x) = -5x - 11$

(2 marks)

iii)  $f(x) = (x - 2)^2$

(2 marks)

(b) Using the graph in Diagram Q3(b), find all values of  $x$  where  $f(x)$  is discontinuous and state why  $f(x)$  is discontinuous at these points, according to the definition of continuity.

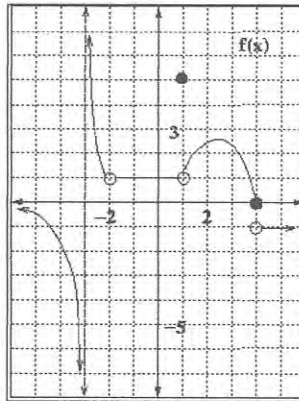


Diagram Q3(b)

(4 marks)

(c) Find  $\frac{dy}{dx}$  for the following equation.

i)  $y = \sin(xy)$ .

(3 marks)

ii)  $y^2 + \cos(x + y) = 3x$ .

(3 marks)

(d) i) Evaluate  $\int 3x^2 + 3\sqrt[4]{x} - \frac{4}{x^3} dx$ .

(3 marks)

ii) Find  $\int \ln x dx$  using integration by parts.

(3 marks)

iii) Using substitution method, evaluate  $\int (x + 1)^5 dx$ .

(3 marks)



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- Q4 (a) | i) Given  $f(t) = t^2 - t$  and  $h(x) = 3x + 2$ , evaluate  $f(h(1))$ . (3 marks)
- ii) Given  $f(x) = x - 1$  and  $g(x) = x^2 + 2x - 8$ , find  $(g \circ f)(x)$ . (3 marks)
- iii) Find the inverse function of  $f(x) = \sqrt{x - 4}$ . (2 marks)

(b) Determine whether the following functions are continuous at  $x = 3$

i)  $f(x) = \frac{x^2 - 9}{x - 3}$  (3 marks)

ii)  $f(x) = \begin{cases} \frac{x^2 - 9}{x - 3}, & x \neq 3 \\ 6, & x = 3 \end{cases}$  (3 marks)

(c) Find the derivative of each of the following functions:

i)  $y = \sqrt{x^2 - 7x}$ . (2 marks)

ii)  $y = \frac{1}{(x^2 - 2x - 5)^4}$ . (2 marks)

- (d) i) Solve  $\int_1^2 \frac{dx}{x}$  by integration. (3 marks)

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- ii) Using Diagram Q4(d), find the area of the region enclosed by the curve and the y-axis given.

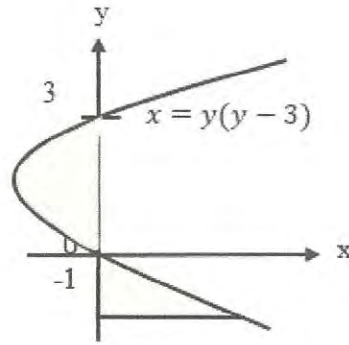


Diagram Q4(d)

(4 marks)



Q5 (a)

For the piecewise-defined function  $f(x) = \begin{cases} x^2 & \text{if } x \leq 1 \\ 3 & \text{if } 1 < x \leq 2 \\ x & \text{if } x > 2 \end{cases}$

i) Sketch the graph of  $f(x)$ .

(3 marks)

ii) Find the domain and range.

(2 marks)

(b) Compute the limits of the following functions:

i)  $\lim_{x \rightarrow 7} \frac{x^2 - 49}{x - 7}$ .

(2 marks)

ii)  $\lim_{x \rightarrow 2} \frac{\sqrt{x+7} - 3}{x - 2}$ .

(3 marks)

iii)  $\lim_{x \rightarrow -\infty} \frac{\sqrt{4x^2 + 1}}{x + 1}$ .

(4 marks)

(c) From the following equation, find  $\frac{dy}{dx}$ .

i)  $x^3 y^4 - 5y = 2x$ .

(2 marks)

ii)  $\sin x + 2 \cos(3y) = 1$ .

(3 marks)

- (d) i) Find  $\int_0^1 e^x dx$  by integration.

(3 marks)

- ii) Using Diagram Q5(d), find the area of the region enclosed by the curve and the y-axis given.

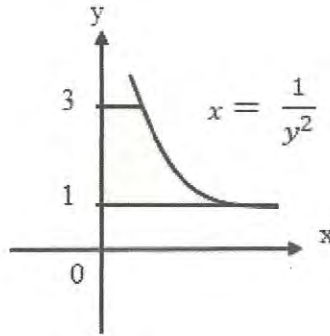


Diagram Q5(d)

(3 marks)

- END OF QUESTION -