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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2017/2018**

COURSE NAME : ENGINEERING MATHEMATICS I
COURSE CODE : BDA 14003
PROGRAMME CODE : BDD
EXAMINATION DATE : DECEMBER 2017 / JANUARY 2018
DURATION : 3 HOURS
INSTRUCTION : ANSWER FIVE (5) QUESTIONS
ONLY

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THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1** (a) Find the domain and range of the function below, without using a graph.

$$f(x) = \frac{\sqrt{x+2}}{x^2-9}$$

(10 marks)

- (b) Let the function as below:

$$f(x) = \frac{x^2-1}{|x-1|}$$

- (i) Find $\lim_{x \rightarrow 1^+} f(x)$ and $\lim_{x \rightarrow 1^-} f(x)$

(6 marks)

- (ii) Does $\lim_{x \rightarrow 1} f(x)$ exists?

(2 marks)

- (iii) Sketch the graph of f .

(2 marks)

- Q2** (a) Differentiate $f(y) = \ln(1 - 5y^2 + y^3)$ by using the Chain Rule.

(5 marks)

- (b) Find y' by implicit differentiation for $2y^3 + 4x^2 - y = x^6$.

(5 marks)

- (c) A thin sheet of ice is in the form of a circle. If the ice is melting in such a way that the area of the sheet is decreasing at a rate of $0.5 \text{ m}^2/\text{sec}$ at what rate is the radius decreasing when the area of the sheet is 12 m^2 ?

(10 marks)

- Q3** (a) Evaluate $\int_0^2 \frac{x^3 - x}{x^2 + 5} dx$

(8 marks)

- (b) Show $\int_0^{\frac{\pi}{4}} \frac{1}{5 \cos^2 x - 1} dx = \frac{1}{4} \ln 3$ by substituting $u = \tan x$

(12 marks)

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Q4 Figure Q4 shows the line (dotted line) generated by combination of a curve and a line; which is the equation for; the first curve, $= \frac{x^2}{100} - 50$, second line is a tangent line of first curve that intersect at $x = 20$.

- (a) Find the total length, l (dotted line in figure) of the second line between the points where $x_1 = 30$ and $x_2 = 60$.

(10 marks)

- (b) Find the surface area generated when the dotted line rotating at $\frac{3}{4}$ of rotation

(10 marks)

Q5 (a) Explain why the function is discontinuous at the given number $a = -3$. Sketch the graph of the function.

$$f(x) = f(x) = \begin{cases} \frac{x^2-x-12}{x+3}, & x \neq -3 \\ -5, & x = -3 \end{cases}$$

(10 marks)

- (b) Use L'Hopital's Rule to evaluate $\lim_{z \rightarrow 0} \frac{\sin(2z)+7z^2-2z}{z^2(z+1)^2}$

(10 marks)

Q6 (a) Use integration by part to evaluate $\int_0^{\pi/2} e^{4x} \sin x dx$

(10 marks)

(b) Let R be the region bounded by the curves $x = y^2$ and $y = x$.

- (i) Sketch the graph function bounded by R.

(4 marks)

(ii) Find the volume of the solid generated when the region is rotated through 360° about the x-axis.

(6 marks)

-END OF QUESTIONS -

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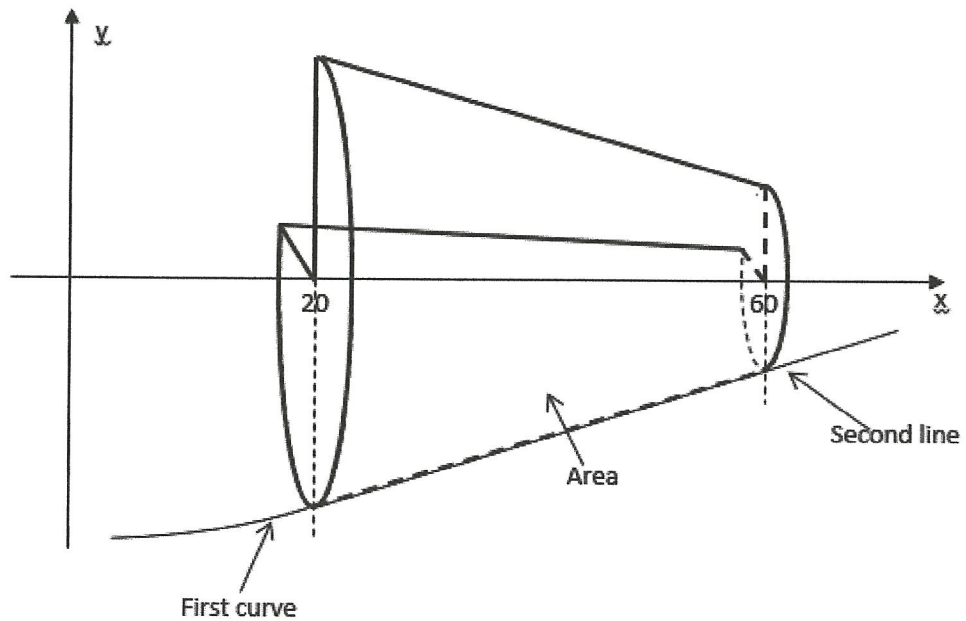


Figure Q4

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