

BA EXAMINATION, 2022
First Year, Semester I
DEPARTMENT OF ECONOMICS
Mathematical Methods in Economics BI

Time : Two hours

Full Marks : 30

Answer question number 1 and any two questions from the rest:

1. Answer any 5 questions :

5X2

(a)) Verify Euler's theorem for the equation :

$$f(x,y) = x^3 - 2x^2y + 3xy^2 + y^3$$

(b) Using extreme value theorem show that $(1-t^4)$ has an optimum value in the interval $(0,1)$.

(c)) Identify the asymptotes &/or holes in the function $f(x) = \frac{4x+2}{x^2-16}$

(d) The gross domestic product (GDP) of a certain country following a national crisis (at $t=0$) is approximated by

$$G(t) = -0.4t^3 + 4.8t^2 + 20 \quad 0 \leq t \leq 12$$

where $G(t)$ is measured in billions of dollars. When during this time period is the GDP at its highest?

(e) Let $f(x) = \frac{1}{x} + 3x$ and $g(x) = -\frac{1}{x} + 6x - 4$ check whether $f(g(x))$ & $g(f(x))$ exist . If they exist identify their domains.

(f) Determine for which truth values of p & q the proposition $p \wedge \neg q \rightarrow p \wedge q$ is false.

2. Sketch the graph of the function(domain is \mathbb{R}) :

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$$f(x) = \frac{x^4 + 4}{x^2}$$

3. (a) Prove that extremum of a function $f(x)$ (domain \mathbb{R}) occurs when the derivative of the function changes sign.

(b) Identify the extremum applying the theorem for the following functions:

(i) $f(x) = 1 + (x - 1)^4$

[Turn over

[2]

(ii) $f(x) = x^2 - 4x + 2$

(iii) $f(x) = \frac{1}{x^6}$ 4+6

4. (a) Identify and classify the critical points of the following function & if any extremum exists classify it as local or global extremum:

$$f(x,y) = 4xy - 2x^2 - y^4$$

- (b) Identify the optimum for the following problem:

Optimize: $f(x,y) = x^2y$ subject to the constraint: $x^2 + 2y^2 = 6$. Give an interpretation to the Lagrange multiplier. 5+4+1