

MIDTERM EXAM - BUSINESS MATHEMATICS I (MA1103)
ACADEMIC YEAR 2022-2023
Monday, 10th October 2022, Time: 120 minutes

Calculator and other calculating tools are prohibited. This exam consists of 2 parts: A (7 numbers, 5 points for each number) dan B (1 number valued 10 points).

PART A

1. Given functions $f(x) = \frac{1}{x+1}$ and $g(x) = \sqrt{x-4}$.

- (a) Determine the domain of f and g .
- (b) Compute $f(5) \cdot g(5)$.

2. Determine a and b such that function

$$f(x) = \begin{cases} 2x - 1 & ; \text{ if } x < -1 \\ ax + b & ; \text{ if } -1 \leq x < 2 \\ 6x & ; \text{ if } x \geq 2 \end{cases}$$

is continuous in $\mathbb{R}$.

3. Find the 2nd derivative of $f(x) = 5\sqrt{x} + \frac{7}{x}$.

4. The total cost to produce q units of goods is given by $C(q) = q^2 + 100q + 200$ dollars.

- (a) Estimate the cost for producing the 11th unit using Marginal Analysis.
- (b) If the level of production now is 10 units, estimate the reduce in total cost if the level of production is lowered 0.3 unit.

5. Compute the Elasticity of demand for the following demand function:

$$D(p) = \sqrt{400 - 0.01p^2}$$

and determine whether the demand is elastic, inelastic, or of unit elasticity at $p = 120$.

6. Find x that satisfies $16^x \left(\frac{1}{2}\right)^{2x} = 64$.

7. Given a function $f(x) = 5e^{x-1} + 3 \ln x$.

- (a) Find $f'(x)$.
- (b) Find the tangent line equation at $x = 1$.

PART B

1. Let $f(x) = \frac{4x}{2x-1}$.

- (a) Determine the domain of f .
- (b) Determine all the asymptotes of f .
- (c) Find $f'(x)$.
- (d) Determine the interval of monotonicity for f .
- (e) Find $f''(x)$.
- (f) Determine the interval of concavity for f .