

Instructions to candidates

Duration: 02 hours

Number of questions: 4 Essay Questions

Mark allocation: 100 mark

Use standard symbols without definition.

Scientific calculators are allowed.

Answer all questions



1.

a. Find each of the following limits.

i. $\lim_{x \rightarrow 5} \left(\frac{x^2 - 3x - 10}{x - 5} \right)$ (5 mark)

ii. $\lim_{x \rightarrow 4} \left(\frac{\sqrt{x} - 2}{x - 4} \right)$ (5 mark)

iii. $\lim_{x \rightarrow +\infty} \left(\frac{x^2 + x - 5}{1 - 2x - x^3} \right)$ (5 mark)

iv. $\lim_{x \rightarrow 0} \left(\frac{\sqrt{4+x} - 2}{x} \right)$ (5 mark)

b. A farmer has to fence off a rectangular flower garden that is twice as long as it is wide.
Express the area of the garden as a function of its width.

(5 mark)

2.

a. Differentiate following functions with respect to x .

i. $y = \left(\frac{x^3 - 5}{x} \right)$ (5 mark)

ii. $y = e^x \sin 2x$ (5 mark)

iii. $y = x^3 \ln x$ (5 mark)

iv. $y = 3x^3 + 5x^{\frac{1}{2}}$ (5 mark)

v. $y = \sin^2(2x)$ (5 mark)

3.

- a. A manufacturer determines that when x thousand units of a particular product are produced, the profit (Rs.) generated will be:

$$P(x) = -400x^2 + 6,800x - 12,000$$

- i. Find the value of profit when 10,000 units are produced. (5 mark)
 - ii. Find the number of products must be produced to obtain the profit value of Rs.12,000. (5 mark)
 - iii. Find the rate of change of profit with respect to x . (5 mark)
 - iv. At what rate is profit changing with respect to x when 9,000 units are produced. (5 mark)
- b. Find the slope of the tangent line to the curve $y = x^3$ at $x = -1$. (5 mark)

4.

- a. Integrate the followings with respect to x .

- i. $\int (e^x + 2 \sin 3x) dx$ (5 mark)
- ii. $\int (3x - 1)^2 dx$ (5 mark)
- iii. $\int x^2(x - 1) dx$ (5 mark)

- b. Find the value of the integrals.

- i. $\int_0^1 (x^3 + 1) dx$ (5 mark)
- ii. $\int_1^2 (2x + 1)^3 dx$ (5 mark)