

Q1.

Find any relative extrema of

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

State where the function is increasing or decreasing and determine points of inflection.

Q2.

Find the absolute maximum and minimum values of

$$f(x) = \frac{x^2}{x^3 + 2}$$

on $[0, +\infty)$, if they exist.

Q3.

The total cost and total revenue functions are

$$C(x) = x^3 - 12x^2 + 50x + 200$$

$$R(x) = x(120 - 3x)$$

a) Write the profit function $P(x)$ and determine the level of output x for which profit is maximized.

b) Find the marginal revenue $MR(x)$ and marginal cost $MC(x)$. Verify that $MR = MC$ at maximum profit.

Q4.

A rectangular box with a square base and a cover is to have a volume of 2000 cm^3 .

If the cost per cm^2 is:

- bottom: \$4
- top: \$2
- sides: \$3

Find the dimensions that minimize the cost.