MTH 201 – Business Calculus: Midterm (17/4/2025)

Full name: ..... TROY ID No.: .....

Q1. Find any relative extrema of $f(x) = x\sqrt{4 - x^2}$. State where the function is increasing or decreasing and determine points of inflection.

Q2. Find the absolute maximum and minimum values of the function $f(x) = \frac{x^2}{2x^3+1}$ over $[0; +\infty)$, if they exist.

Q3. The total cost and total revenue functions for a company are

$$C(x) = x^3 - 15x^2 + 63x + 230, R(x) = x(103 - 2x).$$

a) Write down the equation for the profit function $P(x)$. Hence determine the level of output, x, for which profit is maximized.

b) Find the marginal revenue $MR(x)$ and the marginal cost $MC(x)$. Verify that $MR = MC$ when the profit function has a maximum value.

Q4. A rectangular box with a square base and a cover is to have a volume of 1250 cm^3. If the cost per square cm for the bottom is \$3, for the top is \$2, and for the sides is \$2, what should the dimensions be in order to minimize the cost?