

MATH 1100-001
REVIEW PROBLEMS FOR EXAM 3

Note: Exam 3 will cover sections 11.1 through 11.5 and 12.1 through 12.3 of the text. On the exam you will be allowed one side of a 8.5 by 11 inch sheet of notes. Calculators and other electronic devices are not allowed. The following should not be considered a practice exam, but are a good collection of review problems to help you study for the exam.

1. Find the derivatives of the following functions:

a. $f(x) = e^{-x^2/2}$

b. $f(t) = \ln(t^2)e^t$

c. $2^x \log_2 x$

2. Consider the function $f(x) = e^{-x^2}$.

a. Find the intervals on which f is increasing and decreasing.

b. Find any relative maximum and minimum points.

3. Consider the following equation:

$$ye^x = y^2 + x - 2$$

a. Use implicit differentiation to find $\frac{dy}{dx}$.

b. Find the equation of the tangent line at the point $(0, 2)$.

4. Suppose that the monthly revenue and cost for producing and selling x units of a product are;

$$R(x) = 400x - \frac{x^2}{20} \quad \text{and} \quad C(x) = 5000 + 70x$$

At what rate per month is the profit changing if the number of units sold is 200, and is increasing at a rate of 5 units per month.

5. Suppose that the demand for a product is given by

$$2p^2q = 10,000 + 9,000p^2$$

where p is the price and q is the demand. Find the elasticity of demand when $p = \$50$ and $q = 4502$. How would the revenue be affected by a price increase?

6. Compute the following indefinite integrals (don't simplify your answers):

a.

$$\int x^2 - \frac{1}{x^2} + \frac{1}{\sqrt{x}} dx$$

b.

$$\int x\sqrt{x^2 + 1} dx$$

c.

$$\int \frac{x^2}{3x^3 + 7} dx$$

7. Suppose that the marginal revenue and marginal cost (in dollars) when producing and selling x units are given by

$$R'(x) = 400 - 2x \quad \text{and} \quad C'(x) = -x + 100$$

If the fixed costs are \$1,000, find the profit function. For what quantity of goods sold is the profit maximized?