

REVIEW PROBLEMS FOR FINAL EXAM MATH 1100-001

Remarks:. The final exam will take place Tuesday, December 15, from 10:30AM-12:30PM in the usual classroom. You will be allowed 2 sides of an 8.5 by 11 inch sheet of notes, though calculators and other electronic devices will not be allowed. The exam will be comprehensive, and cover material from chapters 9,10,11,12.1-12.4, and 13.1-13.4 of the text that we covered in class. The following are some review problems, mostly from another instructor's final exam. It shouldn't really be considered a practice exam (I haven't checked it carefully for length or difficulty as I would for the real exam). Solutions will be posted by sometime on Friday. I also recommend looking over the midterm exams, as well as the review problems for those. I will be in my office most Monday afternoon between 1:00pm and 4:30 pm (though out for brief periods).

1a. Find the limits

$$\lim_{x \rightarrow 2} \frac{x^3 - 2x^2}{x^2 + x - 6}$$

b.

$$\lim_{x \rightarrow \infty} \frac{ex^3 + x + 1}{5x^3 + x^2 + 5}$$

2. Find the derivatives of the following functions (don't simplify):

a.

$$f(x) = \frac{2x^3 + 2x + 6}{x^2 - 1}$$

b.

$$f(x) = (x^2 + 1)\ln(x^3 - 1)$$

c.

$$f(x) = e^{5x^2} + \frac{3}{\sqrt{x}} - 2x^5$$

3a. Find the derivative of $f(x) = x^2 - 2x$ from the definition of the derivative.

b. Find the equation of the tangent line at $x = 1$.

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

a. Find the intervals on which f is increasing and decreasing, as well as any relative maximum/minimum points.

b. Find the intervals on which f is concave up and concave down.

c. Sketch the graph of f .

5. Assume that the following equation defines y as a function of x . Use implicit differentiation to find y' in terms of x and y .

$$2x^3 - 5xy + y^2 = 4$$

6. Suppose that the total revenue function for a product is given by $R(x) = 100x - 0.2x^2$.

a. How many units will maximize the total revenue?

b. Find the maximum revenue.

c. If the production is limited to 200units, how many units will maximize the revenue?

7. Compute the following integrals:

a.

$$\int_1^2 \left(10x^4 - \frac{12}{x^3} \right) dx$$

b.

$$\int \frac{-2}{5x+7} dx$$

c.

$$\int 4x^3 e^{-x^4+1} dx$$

8. Sketch the region in the plane bounded by the curves $y = 2x - 4$ and $y = x^2 - 4$, and find its area.

9. Suppose that the profit a company makes per day (in thousands of dollars) in the month of June is given by

$$P(t) = 100 - 0.2t + 0.3t^2$$

where t is the day of the month. Find the average daily profit for the first 10 days of the month.

10. A certain firm's marginal cost is $C'(x) = 6x + 60$, its marginal revenue is $R'(x) = 180 - 2x$, and the cost of cost of producing 10 units is \$1000.

a. Find the profit function.

b. Find the optimal level of production.

c. Find the profit or loss at the optimal level of production.