HOMEWORK 5 - MATH 112 DUE DATE: Monday, October 29 INSTRUCTOR: George Voutsadakis

Read each problem **very carefully** before starting to solve it. Four out of the eight problems will be chosen at random and graded. Each problem graded is worth 3 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

- 1. A rectangular page is to contain 30 square inches of print. The margins at the top and at the bottom are to be 2 inches wide. The margins on each side are to be 1 inch wide. Find the dimensions of the page such that the least amount of paper is used.
- 2. An offshore oil well is 1 mile off the coast. The oil refinery is 2 miles down the coast. (See the figure on page 218 of your book.) Laying pipe in the ocean is twice as expensive as laying it on land. Find the most economical path for the pipe from the well to the oil refinery.
- 3. Find the limits $\lim_{x\to 1^+} \frac{2+x}{1-x}$ and $\lim_{x\to 0^-} (x^2 \frac{1}{x})$.
- 4. Find the limits $\lim_{x\to\infty} \frac{5x^3+1}{1-x^3-3x^2+7}$ and $\lim_{x\to\infty} \frac{2x^{10}-1}{10x^{11}-3}$.
- 5. Analyze (intercepts, monotonicity, maxima, concavity, inflection points) and sketch the graph of each of the following functions:
 - (a) $f(x) = -x^3 + 3x^2 + 9x 27$.
 - (b) $f(x) = x^4 4x^3 + 5$.
- 6. Analyze (domain, intercepts, asymptotes, monotonicity, maxima, concavity, inflection points) and sketch the graph of $f(x) = \frac{2x}{1-x^2}$.
- 7. Analyze (domain, intercepts, asymptotes, monotonicity, maxima, concavity, inflection points) and sketch the graph of $f(x) = \frac{x^2+1}{x^2-1}$.
- 8. Sketch the graph of the function $f(x) = 3^x$. Then use transformations to obtain the graph of the function $g(x) = -3^x + 5$.