

HOMEWORK 4 - MATH 112

DUE DATE: Thursday, October 6

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Find the critical numbers and the open intervals on which the function is increasing or decreasing.

(a) $f(x) = -x^2 + 2x$

(b) $g(x) = \sqrt{4 - x^2}$

2. Use the sign table for the first derivative to find all relative extrema of the functions

(a) $f(x) = x^4 - 12x^3$

(b) $g(x) = x^4 - 32x + 4$

3. Find the absolute extrema of the function on the given interval:

(a) $f(x) = x^2 + 2x - 4$ on $[-1, 1]$

(b) $g(x) = x^3 - 3x^2$ on $[-1, 3]$

(c) $h(x) = \frac{2x}{x^2+4}$ on $[0, +\infty)$.

4. Use the second-derivative test, when applicable, to identify all relative extrema of the function:

(a) $f(x) = x^3 - 5x^2 + 7x$

(b) $g(x) = \frac{x}{x^2-1}$

5. Find the inflection points of the graph of

(a) $f(x) = -4x^3 - 8x^2 + 32$

(b) $g(x) = (x - 2)^3(x - 1)$

6. Use the sign table analysis to graph the functions

(a) $f(x) = -x^3 + 3x^2 + 9x - 2$

(b) $g(x) = x^4 - 4x^3 + 16x - 16$

7. A rectangular page is to contain 30 square inches of print. The margins at the top and bottom of the page 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.

8. The combined perimeter of a circle and a square is 16 units. Find the dimensions of the circle and square that produce a minimum total area.