

Math 262: Homework 4 (due W February 4)

I. Read chapter 13 and reread the appendix to chapter 8.

II. Do the following questions. These questions are mainly a review of the stuff done so far this term. Since we've only just started integration, we're not really ready to do many of the problems from chapter 13 yet.

1.

- (a) State the Mean Value Theorem (carefully!)
- (b) Prove that if $f'(x) < 0$ on an interval then f is decreasing on that interval.
- (c) Suppose that f is continuous on an interval $[a, b]$, and $c \in (a, b)$. Prove that if $f'(x) < 0$ for all $x \in (a, c)$ and $f'(x) > 0$ for all x in (c, b) then c is a local minimum of f .

2. Do problem 16 of chapter 11 ("A right angle is moved along the diameter of a circle...").

3. Consider the function $f(x) = 1/(1 + x^2)$ on the interval $[0, \infty)$.

- (a) Prove that f is decreasing on this interval.
- (b) What is the domain of f^{-1} ?

4. Prove that if $f(x)$ is increasing then so is $f^{-1}(x)$.

5. Find the derivatives of the following:

- (a) $f(x) = \sin(x + \sin(x + \sin(x)))$.
- (b) $f(x) = (x^2 + (x^2 + (x^2 + 1)^2)^2)^2$.

6. Do the following questions from chapter 13:

1 Prove that $\int_0^b x^3 dx = b^4/4...$

3 Using Problem 2-7...

4 This problem outlines a clever way...

5 Evaluate without doing any...

6 Prove that...