Math 139 February 29, 2008

Assignment 8
(Due March 6, 2008)

Reading: (*from Reed*) §4.5, 4.6

Problems: §4.2: #2, 3, 4, 5, 6, 12
§4.3: #7, 11(a,b,d,e)–without using Taylor's theorem

Additional Problems:

1. Examine the difference quotient used in the definition of the derivative of $\cos x$ and write down, but do not evaluate, the limits you need to know in order to compute $\cos' x$. In this context, what is wrong with your answer to # 4, §4.2?

2. Use Taylor's theorem to show that if f and g are $(n+1)$-times continuously differentiable functions on an open interval containing x_0, $f^{(k)}(x_0) = g^{(k)}(x_0) = 0$ for $k = 0, 1, \ldots, n$, and $g^{(n+1)}(x_0) \neq 0$, then

$$\lim_{x \to x_0} \frac{f(x)}{g(x)} = \frac{f^{(n+1)}(x_0)}{g^{(n+1)}(x_0)}$$

4. Use 3. to compute

$$\lim_{x \to 0} \frac{x^2 - \sin^2 x}{x^2 \sin^2 x}$$