MATH 10250 Homework 3

1. Show that

$$f(x) = |x|$$

is not differentiable at x = 0 by proving that the limit

$$f'(0) = \lim_{h \to 0} \frac{|x+h| - |x|}{h} \bigg|_{x=0}$$

does not exist.

- 2. Show that if f''(x) < 0 on some interval (a, b) then the graph of f(x) on (a, b) must be concave down.
- 3. Sketch a graph of the function

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

without using a calculator. Clearly label all critical points, inflection points, y-intercept, and x-intercepts.