## MATH 10250 Homework 3

1. Show that

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

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

$$
f^{\prime}(0)=\left.\lim _{h \rightarrow 0} \frac{|x+h|-|x|}{h}\right|_{x=0}
$$

does not exist.
2. Show that if $f^{\prime \prime}(x)<0$ 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

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

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

