Math 323 — **Quiz 2** — May 9, 2024

The questions are to be answered directly on this paper as indicated. Total: 50 pts.

Name:_____

1. Prove that if f and g are differentiable on $\mathbb{R}$, if $f(0) = g(0)$ and if $f'(x) \leq g'(x)$ for all $x \in \mathbb{R}$, then $f(x) \leq g(x)$ for $x \geq 0$. (You may use theorems established in the text.) (20 pts.)

2. Let $f(x) = x \sin \frac{1}{x}$ for $x \neq 0$ and $f(0) = 0$. As noted in the text, f is continuous at $x = 0$. Is f *differentiable* at $x = 0$? **Justify** your answer. (10 pts.)

3. Prove item (ii) of Corollary 29.7: (20 pts.)
Let f be a differentiable function on the interval (a, b). Then f is strictly decreasing if $f'(x) < 0$ for all $x \in (a, b)$. (You may assume the Mean Value Theorem.)

Name:_____