

MATH 171

Test 2

April 8, 2005

Name: _____

- No books, notes, or calculators are allowed.
- Please show all your work.

1. (6 points) Give the definition of $\lim_{x \rightarrow \infty} f(x) = L$.

2. (6 points) State Rolle's theorem.

3. (14 points) State and prove the sign-preserving property.

4. (12 points) Find all $a \in \mathbb{R}$ such that $f(x) = \frac{ax + 2}{x + 1}$ is strictly increasing on $(1, 2)$.

5. (12 points) Let $f(x)$ and $g(x)$ be uniformly continuous on \mathbb{R} . Prove that $(f + g)(x)$ is uniformly continuous on \mathbb{R} .

6. (**For extra credit**, 10 points) Prove or disprove each of the following statements:

(a) If a function is continuously differentiable on \mathbb{R} then it is twice differentiable on \mathbb{R} .

(b) If a function is continuously differentiable 100 times on \mathbb{R} then it is differentiable 101 times on \mathbb{R} .