Exam 2 Math 341 **Name** ________________________

1. State and prove the Maximum-Minimum Theorem.

2. State and prove the Mean Value Theorem.

3. Suppose that f is continuous on the closed interval $I = [a, b]$, that f is differentiable on the open interval (a, b), and that $f'(x) = 0$ for $x \in (a, b)$. Show that f is constant on I.

4. State the Boundedness Theorem.

5. State the Uniform Continuity Theorem

6. State Taylor's Theorem with a formula for the Remainder

7. Evaluate $\lim_{x \to 0^+} \sin(x) \ln(x)$

8. Define precisely $U(f, P), L(f, P), U(f)$ and $L(f)$. In terms of these quantities, when is f Darboux integrable?

9. If f is uniformly continuous on $A \subseteq \mathbf{R}$ and $|f(x)| \geq k > 0$ for all $x \in A$, show that $1/f$ is uniformly continuous on A.

10. Let $f(x)$ be the Dirichlet function on the interval $[0, 1]$, i.e., $f(x) = 1$ if x is rational and $f(x) = 0$ if x is irrational. Show that f is not Darboux integrable.