**ADVANCED CALCULUS II, DR. BLOCK,**
**SAMPLE EXAM 1, SPRING 2020**

Note: The maximum possible score is 50.

1. (10 points) State and prove Rolle's Theorem.

2. (10 points) Suppose that the function $f$ satisfies $|f(x) - f(t)| \leq (x-t)^2$ for all $x, t \in \mathbb{R}$. Prove that $f$ must be a constant function.

3. (10 points) Find the $n$th Taylor polynomial for the given function centered about $x = a$. Show your work.

$$f(x) = \cos x,\ a = 0.$$

4. (10 points) Evaluate the limit. Show your work and justify your answer.

$$\lim_{x \to \infty} \left(\frac{x}{x+1}\right)^x$$

5. (10 points) If $f(x) = |x|^3$, compute $f'''(0)$, if possible. Show your work and justify your answer.