Quiz 3
Math 311

Name: 
Total Score: 10 pts

1. (3 pts) Use $\varepsilon - \delta$ definition to prove that $f(x) = \frac{2}{1 + x}$ is continuous at $x = 3$.

2. (3 pts) Use the definition of uniform continuity or a theorem about uniform continuity to prove that $f(x) = \frac{2}{1 + x}$ is uniformly continuous on the interval $[3, \infty)$. If you use a theorem, please state the theorem.

3. (4 pts) Let $f(x)$ be a continuous function on $[0, 1]$, $f(0) = 0$ and $f(1) = 2$. Choose TRUE or FALSE for the following statements.

   - T  F  If there exists $x_n \in (0, 1)$ such that $f(x_n) = 4 - \frac{1}{n}$ for all $n \in \mathbb{N}$, then there exists $x \in (0, 1)$ such that $f(x) = 4$.
   - T  F  $f(x)$ could be unbounded on $[0, 1]$.
   - T  F  If there exists $x \in (0, 1)$ such that $f(x) = 4$, then there exist at least two points $y, z \in (0, 1)$ such that $f(y) = 3$ and $f(z) = 3$.
   - T  F  $f(x)$ must be uniformly continuous on $[0, 1]$. 