Math 325. Quiz #11

(1) State the definition for the **derivative** of the function $g(x)$ at some real number r.

(2) TRUE OR FALSE, and *justify* with a short proof or example:
If $f(x)$ is not differentiable at $x = 2$, then $g(x) = f(2x)$ is not differentiable at $x = 4$.

(3) TRUE OR FALSE, and *justify* with a short proof or example:
If $f(x)$ is differentiable on $\mathbb{R}$ and f attains a maximum value on $[0, 2]$, then there is some $c \in [0, 2]$ such that $f'(c) = 0$.

Bonus: Prove or disprove: If $\lim_{x\to 1} f(x) = 2$ and $\lim_{x\to 2} g(x) = 3$, then $\lim_{x\to 1}(g \circ f)(x) = 3$. (Here, $g \circ f$ denotes composition of functions: $(g \circ f)(x) := g(f(x))$.)