

Homework # 5 (Due Oct 24th)

1. (3 pts) Use the definition to prove that $f'(a)$ exist for $f(x) = \frac{1}{x}$.(Hint: Just show the limit of the difference quotient exists.)
2. (3 pts) Let I be an open interval that contains 0 and $f : I \rightarrow R$. If there exists an $\alpha > 1$ such that $|f(x)| \leq |x|^\alpha$ for all x , prove that f is differentiable at 0. What happens when $\alpha = 1$?
3. (3 pts) Show that $f(x) = \sqrt[3]{x}$ is not differentiable at $x = 0$.(Show the limit of the difference quotient is not finite.)
4. (2 pts) For $k(x) = \sqrt{8x^3 + 1}$, use the chain rule to find $k'(x)$.