

Homework 7

Due Wednesday, October 27th at the beginning of class. Justify your answers. Please let me know if you have a question or find a mistake.

1. Exercise 14.1.2 from page 205. Use the rule $e^{a+b} = e^a e^b$.
2. Prove that if $f: \mathbb{R} \rightarrow \mathbb{R}$ obeys $|f(x)| \leq 30x^2$, then f is differentiable at 0 and find $f'(0)$.
3. Exercise 15.1.4 from page 218.
4. Part (a) of Exercise 15.2.2 from page 218.
5. Let f be a differentiable function on the interval $(-4, 5)$ such that $f(0) = 0$ and $-3 \leq f'(x) \leq 2$ for all x in $(-4, 5)$. Find A and B such that

$$A < f(x) < B$$

for all x in $(-4, 5)$. Justify your answer using the mean value theorem. Also show that if C is any number in (A, B) , then there is a choice of f satisfying the above requirements such that $f(x) = C$ for some x in $(-4, 5)$.

Hint: For the last part, try making f a linear function.

6. Exercise 15.4.2 from page 219.