Week 5: June 9th - June 15th

Suggested Problems

Problems you may find instructive, or that I find interesting.

§4.10 #18, 23, 29 & 39

(These problems were suggested last week.)

§4.11 #5, 8, 17, 20, 25, 27 & 31

(Questions #27 & 31 may help your understanding of §3.1)

Note: question #25 asks you to find $\epsilon_{rr} > 0$ so that,

$$x \in (x_0 - \epsilon_{rr}, x_0 + \epsilon_{rr}) \Rightarrow -0.1 < \frac{dA - \Delta A}{A} < 0.1,$$

where x_0 is the (unknown) true diameter. This type of calculation is common in physics.

§4.12 #5, 7, 9, 13 & 18

Reminder: $\frac{d}{dx}\ln(x) = \frac{1}{x}$ and $\frac{d}{dx}e^x = e^x$

§11.5 #7, 9, 17, 25, 29, 37, 45, 47 & 57

(Please do **not** attempt #8, 30 → 33, 36 & 49 → 54)

§11.6 #8, 16, 19, 20, 23, 25, 43, 53, 59 & 65

(Please do **not** attempt #13, 29, 46, 54, 61 & 62)

§4.1 #4, 9, 12, 17, 22, 29, 30, 35, 42 & 45

(Hint: for #17 use §3.1 to find the derivative.)

(Question #42 shows up again in Chapter 12; #45 is used to prove L'Hôpital's Rule.)

§4.2 #3, 9, 17, 35, 43, 45, 53, 57, 59 & 60

(Hint: for #45 use MVT; for #59 use induction)

§4.3 #9, 19, 23, 27, 35, 36, 43 & 51

(You do not need to graph #51.)

Assigned Problems

Due **June 16th**, in lecture.

1. Let $f(x) = 1 - \frac{1}{x}$. Prove that Newton's Method fails to find the solution if $x_1 < 0$ or $x_1 > 2$.
   Hint: If $x_n < 0$, show that $x_{n+1} < x_n$. For $x_1 > 2$, run the first iterate.

2. Show that if $\alpha > 0$ then,
   $$\lim_{\theta \to \infty} \theta \left(\alpha^{\frac{1}{\theta}} - 1 \right) = \ln(\alpha).$$
   This is §11.5 #44.

3. Prove that $\sqrt{x+5} < \frac{x}{10} + 3$ for all $x > 20$.