Review for Second Exam

The second exam will cover sections 6.3, 6.4, 7.1, and 7.2 of the text. It will also cover a little bit about logarithms: namely, the proof that the derivative of $\ln x$ is $1/x$ (see below).

For this exam you should know that

$$\lim_{h\to 0} \frac{e^h - 1}{h} = 1,$$

and be able to prove that the derivative of e^x is e^x and the derivative of $\ln x$ is $1/x$. You can find proofs of both of these facts in your lecture notes from class, and you can find a proof that the derivative of $\ln x$ is $1/x$ in the text, on pages 411–412.

Here is a proof that the derivative of e^x is e^x:

$$\begin{aligned}
\frac{d}{dx}e^x &= \lim_{h\to 0} \frac{e^{x+h} - e^x}{h} \\
&= \lim_{h\to 0} \frac{e^x e^h - e^x}{h} \\
&= \lim_{h\to 0} e^x \left(\frac{e^h - 1}{h}\right) \\
&= e^x \lim_{h\to 0} \frac{e^h - 1}{h} \\
&= e^x \cdot 1 = e^x.
\end{aligned}$$

There is also a proof of this fact in the text, but it is spread out over several pages and interspersed with other material. You can write the proof differently if you like, as long as you express the essential points.

Here is a brief discussion of what material in the text is relevant to the exam:

6.3 We covered this whole section. It's probably a good idea to briefly review section 6.2 as well, just to put 6.3 in the proper context, though I won't be asking questions over 6.2.

6.4 We covered this whole section.

7.1 We covered most of this section (namely, pages 385 to 388, and the formula

$$\frac{dy}{dx} = \frac{1}{dx/dy}$$

on page 390), but I did not assign homework on it. This material is fundamental to understanding the course better, but there won't be any questions on the exam that specifically treat it — except that I might ask for the proof that the derivative of $\ln x$ is $1/x$, which uses the above formula.

7.2 We covered this whole section.