Math 204, Section 45

Homework 7

Due May 19, 2005, at 6 pm

Textbook page 103 1, 2, 11 (a) and (b)

Problem I Show that for $n \in \mathbb{N}$ the following hold:

$$
\lim_{x \to +\infty} \frac{e^x}{x^n} = +\infty, \quad \lim_{x \to -\infty} x^n e^x = 0, \quad \lim_{x \to +\infty} e^x - x^n = +\infty.
$$

Problem II By using the graph of $\sin : \mathbb{R} \to \mathbb{R}$ or otherwise, construct the graph of $\cos : \mathbb{R} \to \mathbb{R}$. Show that the function $\cos : [0, \pi] \to [-1, 1]$ is invertible and its inverse has the property

$$
\arccos'(x) = \frac{-1}{\sqrt{1 - x^2}}, \quad x \in (-1, 1).
$$

Problem III Construct the graph of $\tan : D \to \mathbb{R}$, $\tan(x) = \sin(x)/\cos(x)$, where $D = \mathbb{R} - \{\pi/2 + n\pi \mid n \in \mathbb{Z}\}$. Show that the function $\tan : [-\pi/2, \pi/2] \to \mathbb{R}$ is invertible and its inverse has the property

$$
\arctan'(x) = \frac{1}{1 + x^2}.
$$

Textbook page 109 3, 4, 7, 13, 14, 15 (use L'Hospital)

Textbook page 112 5.

Turn in your individually written solutions to Jim right before the Problem Session.