MATH 1953 Practice Midterm 2

Name: _____

Instructions: Please answer each question as completely as possible, and show all work unless otherwise indicated. You may use an approved calculator for this quiz. (Approved: non-graphing, non-programmable, doesn't take derivatives)

1. Does the improper integral $\int_1^\infty xe^{-x}\,dx$ converge or diverge?

2. Use the Comparison Test to decide whether the improper integral

$$\int_1^\infty \frac{2x^2}{x^5+10}\,dx$$

converges or diverges. DO NOT attempt to find the value of the integral!

3. Using any techniques you wish, answer the following questions about the sequence $x_n = \frac{n}{n^2+1}$.

(a) Does x_n converge to a limit? If so, find the limit.

(b) Is x_n increasing, decreasing, or neither?

(c) Is x_n bounded from above, bounded from below, both, or neither?

4. Determine whether the following series converges or diverges, and if it converges, find its sum exactly.

$$\sum_{n=1}^{\infty} \frac{3^{n+1}}{5^{n-1}}$$