Math 1B Midterm 2 practice

You are allowed 1 sheet of notes. Calculators are not allowed. Each question is worth 3 marks, which will only be given for correct working and a clear and correct answer in simplified form. Write the final answer to each question on the coversheet, and attach the coversheet to your bluebook.

3. Determine whether the sequence $(-1)^{n-1} n/(n^2 + 1)$ converges or diverges.

4. Determine whether the series $\sum_{k=2}^{\infty} \frac{k^2}{k^2-1}$ converges or diverges.

5. Determine whether the series $\sum_{n=2}^{\infty} \frac{1}{n \ln(n)}$ converges or diverges.

6. Show that the series $\sum_{n=1}^{\infty} \frac{(-2)^n}{n!}$ converges, and find how many terms are necessary to find the sum with an error less than .01.

7. Find the radius of convergence of the series $\sum_{n=1}^{\infty} \frac{(-2)^n x^n}{\sqrt[4]{n}}$.

8. Find a power series representation for the function $f(x) = \frac{x}{9+x^2}$ and find its interval of convergence.

9. Evaluate the integral $\int \frac{x - \tan^{-1} x}{x^3} dx$ as a power series and find its radius of convergence.

10. Find the Taylor series for e^x centered at the point $a = 3$.

11. Use series to evaluate the limit $\lim_{x \to 0} \frac{\sin(x) - x + x^3/6}{x^5}$.

12. Estimate the range of values for which the approximation $\sin(x) \cong x - x^3/6$ is accurate to within an error of .01.