Math 2000: Assignment #4, Due Monday Feb 13

1. Use the ratio test to determine whether the following series converge or diverge.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{n!}{3 \cdot 6 \cdot 9 \cdots (3n)}$

   (b) $\displaystyle\frac{2}{5} + \frac{2 \cdot 6}{5 \cdot 8} + \frac{2 \cdot 6 \cdot 10}{5 \cdot 8 \cdot 11} + \frac{2 \cdot 6 \cdot 10 \cdot 14}{5 \cdot 8 \cdot 11 \cdot 14} + \cdots$

2. Determine if each of the following series is absolutely convergent, conditionally convergent, or divergent.

   (a) $\displaystyle\sum_{n=1}^{\infty} \frac{n^2}{2^n}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{(\arctan n)^n}$

   (c) $\displaystyle\sum_{n=1}^{\infty} e^{-n} n!$

   (d) $\displaystyle\sum_{n=1}^{\infty} \frac{\sin 4n}{4^n}$

   (e) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n}{n^2 + 1}$

   (f) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n 5^{2n}}{3^{3n}}$

   (g) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n \sqrt{n}}{3^n}$

   (h) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{(\ln n)^n}$

3. Determine whether the following series converge or diverge.

   (a) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n}{n^2 + 25}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{3n}{1 + 8n} \right)$

   (c) $\displaystyle\sum_{n=1}^{\infty} \frac{2^n n!}{(n+2)!}$

   (d) $\displaystyle\sum_{n=1}^{\infty} \sin n$

   (e) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^{n-1}}{\sqrt{n} - 1}$

   (f) $\displaystyle\sum_{n=1}^{\infty} \frac{\sqrt{n^2 - 1}}{n^3 + 2n^2 + 5}$

   (g) $\displaystyle\sum_{n=1}^{\infty} \frac{e^{1/n}}{n^2}$

   (h) $\displaystyle\sum_{n=1}^{\infty} \frac{(2n)^n}{n^{2n}}$

   (i) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n + n \cos^2 n}$

   (j) $\displaystyle\sum_{n=1}^{\infty} \left(\sqrt[n]{2} - 1 \right)$