Full name(s): ______________________________ .

Questions

1. Use the ratio test to evaluate whether each of the following series converges absolutely:
   (a) $\sum_{n=1}^{\infty} \frac{n^2}{n!}$
   (b) $\sum_{n=1}^{\infty} \frac{n}{2^n}$
   (c) $\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$
   (d) $\sum_{n=1}^{\infty} \frac{n!(n+1)!}{(2n)!}$
2. Use the root test to evaluate whether the following series converge absolutely:
   (a) $\sum_{n=1}^{\infty} (\frac{2}{n})^n$
   (b) $\sum_{n=1}^{\infty} (\frac{5n+1}{3n^2})^n$
   (c) $\sum_{n=2}^{\infty} \frac{e^n}{(\ln(n))^n}$
3. Determine whether the series converges conditionally, converges absolutely, or diverges.
   (a) $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{\sqrt{3n-1}}$
   (b) $\sum_{n=1}^{\infty} \sin(n)/n^2$
   (c) $\sum_{n=1}^{\infty} \frac{3}{\ln(n^2)}$
   (d) $\sum_{n=1}^{\infty} \frac{n(n+1)}{\sqrt{n^3+2n^2}}$
   (e) $\sum_{n=1}^{\infty} \frac{(n-1)!}{n^2}$
   (f) $\sum_{n=1}^{\infty} (\frac{\cos(n)}{n})^n$
   (g) $\sum_{n=3}^{\infty} \cos(\pi n) \frac{1}{\ln(\ln(\ln(n)))}$
4. Determine the radius of convergence of each of the following power series, as well as the behavior at the endpoints the radius of convergence is finite:
   (a) $\sum_{n=0}^{\infty} \frac{n^2}{n!} x^n$
   (b) $\sum_{n=1}^{\infty} \frac{1}{n^2} x^n$
   (c) $\sum_{n=2}^{\infty} \frac{x^n}{n \ln(n)}$
   (d) $\sum_{n=0}^{\infty} \frac{(1+n)^{2n}}{(1+n+2n^2)^n} x^n$