1. Determine whether the following series is convergent or divergent.

   (i). $\sum \frac{n!}{2^{n^2}}$

   (ii). $\sum (\frac{n^2+1}{2n^2+1})^n$

2. Determine whether the following series is absolutely convergent, conditionally convergent or divergent.

   (i). $\sum \frac{(-1)^n \tan^{-1} n}{n^2}$

   (ii). $\sum (\frac{-2}{n})^n$

3. $\{b_n\}$ is a sequence and $\lim_{n\to\infty} b_n = \frac{1}{2}$. Determine whether the given series is absolutely convergent, conditionally convergent or divergent.

$$\sum \frac{(-1)^n n!}{n^n b_1 b_2 \ldots b_n}$$

4. Find all the values for k such that the series

$$\sum \frac{(n!)^2}{(kn)!}$$

   converges.

5. Find the radius of convergence and interval of convergence of the power series.

   (i). $\sum_{n=1}^{\infty} \frac{n}{4^n}(x+1)^n$

   (ii). $\sum_{n=1}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}$

6. Let p and q be real numbers with $p < q$. Find a power series whose interval of convergence is $[p, q)$.