Workshop Exercises: Infinite Series I

1. Determine whether the series is convergent or divergent. If the series is alternating, determine whether it is absolutely convergent, conditionally convergent, or divergent.

a) $\sum_{n=1}^{\infty} \frac{n}{2n^3+4n+2}$.

b) $\sum_{n=1}^{\infty} \frac{n!}{n^2}$.

c) $\sum_{n=1}^{\infty} n e^{-n^2}$.

d) $\sum_{n=1}^{\infty} \frac{3}{\sqrt{n^3+2n+1}}$.

e) $\sum_{n=1}^{\infty} \cos\left(\frac{\pi}{n}\right)$.

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

g) $\sum_{n=1}^{\infty} \frac{(2n)^n}{n^{3n}}$.

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

i) $\sum_{n=2}^{\infty} \frac{(-1)^n}{\ln n}$

j) $\sum_{n=1}^{\infty} \frac{n^n}{n!}$.

k) $\sum_{n=1}^{\infty} \frac{n}{(-3)^n}$.

l) $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$.

2. Approximate $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!}$ to three decimal places.

3. Find the radius of convergence and interval of convergence of the series.

a) $\sum_{n=0}^{\infty} \frac{x^n}{n^2}$.

b) $\sum_{n=0}^{\infty} \frac{x^n}{(n+1)2^n}$.

c) $\sum_{n=1}^{\infty} \frac{x^n}{n!}$.

d) $\sum_{n=0}^{\infty} \frac{(2n)!\, x^n}{2^n}$.

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

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

g) $\sum_{n=1}^{\infty} \frac{3^n (x+1)^n}{n}$.