

1. Determine whether or not the sequence $\{a_n\}$ converges and find its limit if it does converge.

a. $a_n = \frac{8n-7}{7n-8}$

b. $a_n = \frac{n-e^n}{n+e^n}$

c. $a_n = \left(1 + \frac{1}{n}\right)^n$

d. $a_n = \frac{n^3}{10n^2+1}$

2. Find the Taylor Series for

a. $f(x) = \frac{1}{(x-4)^2}$ at $a = 5$.

b. $f(x) = \frac{1}{\sqrt{2x}}$ at $a = 2$

3. Evaluate the indefinite integral as an infinite series

a. $\int \frac{\sin x}{x} dx$

b. $\int \frac{e^x - 1}{x} dx$

4. Find the sum of the following series:

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

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

c. $\sum_{n=1}^{\infty} \left[\left(\frac{7}{11}\right)^n - \left(\frac{3}{5}\right)^{n+1} \right]$

5. Determine whether the following series are absolutely convergent, conditionally convergent, or divergent. . Justify your answers by citing relevant tests or reason.

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

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

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

6. Determine the interval of convergence for the following power series:

a.
$$\sum_{n=0}^{\infty} \frac{n!x^{2n}}{10^n}$$

b.
$$\sum_{n=1}^{\infty} \frac{(x-1)^n}{n3^n}$$

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

7. Determine whether the following series converge or diverge. Justify your answers by citing relevant tests or reason.

a.
$$\sum_{n=0}^{\infty} \frac{(-2)^n}{3^n+1}$$

b.
$$\sum_{n=0}^{\infty} \frac{n!}{e^{n^2}}$$

c.
$$\sum_{n=1}^{\infty} \frac{\sqrt{n^2-1}}{n^3+2n^2+5}$$

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

e.
$$\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$$

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

g.
$$\sum_{n=1}^{\infty} \frac{\tan^{-1} n}{n\sqrt{n}}$$

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