Sheet-2

Q.1. Check whether the following series are convergent or divergent.

1) $\sum_{n=1}^{\infty} n3^{-n^2}$, 2) $\sum_{n=1}^{\infty} \frac{1}{n\left(1+(\ln n)^2\right)}$, 3) $\sum_{n=1}^{\infty} \frac{2^{-\ln n}}{n}$, 4) $\sum_{n=1}^{\infty} \frac{4}{(n+1)|}$,
5) $\sum_{n=1}^{\infty} \frac{1}{n^n}$, 6) $\sum_{n=1}^{\infty} \frac{\tan^{-1} n}{n^2}$, 7) $\sum_{n=1}^{\infty} \frac{\sec^{-1} n}{2^{n-1}}$, 8) $\sum_{n=1}^{\infty} \frac{\sin^2 n}{4+n^{\frac{3}{2}}}$,
9) $\sum_{n=1}^{\infty} \frac{4}{(n+1)5^n}$, 10) $\sum_{n=1}^{\infty} \frac{\ln n}{n^4}$, 11) $\sum_{n=1}^{\infty} \sin\left(\frac{1}{n}\right)$, 12) $\sum_{n=1}^{\infty} \ln\left(1+\frac{1}{2^n}\right)$,
13) $\sum_{n=1}^{\infty} \frac{\cos n+3^n}{n+5^n}$, 14) $\sum_{n=1}^{\infty} \frac{n+\ln n}{n^3+5}$, 15) $\sum_{n=1}^{\infty} \frac{4n^2+2n+1}{\sqrt{(n^2+1)(n^2+2)}}$, 16) $\sum_{n=2}^{\infty} \frac{1}{\sqrt{\ln n}}$

Answers: 1) Convergeent, 2) Convergent, 3) Convergent, 4) Convergent, 5) Convergent, 6) Convergent, 7) Convergent, 8) Convergent, 9) Convergent, 10) Convergent, 11) Divergent, 12) Convergent, 13) Convergent, 14) Convergent, 15) Divergent, 16) Divergent.

Q.2. Check whether the following series are convergent or divergent.

1) $\sum_{n=1}^{\infty} \frac{n!}{n^n}$, 2) $\sum_{n=1}^{\infty} \frac{n^n}{n!}$, 3) $\sum_{n=1}^{\infty} \left(\frac{\ln n}{n}\right)^n$, 4) $\sum_{n=1}^{\infty} \left(\frac{e^n}{n^e}\right)$, 5) $\sum_{n=1}^{\infty} \frac{n+2}{n!}$,
6) $\sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^2}$, 7) $\sum_{n=1}^{\infty} \left(\frac{n+2}{2n+1}\right)^n$, 8) $\sum_{n=1}^{\infty} \frac{(n+1)2^n}{n^2 3^n}$, 9) $\sum_{n=1}^{\infty} \frac{n4^n}{3^{n-1}}$,

10) $1+\frac{1.3}{2!}+\frac{1.3.5}{5!}+...+\frac{1.3.5....(2n-1)}{n!}+.....$

Answers: 1) Convergent, 2) Divergent, 3) Convergent, 4) Divergent, 5) Conergent, 6) Divergent, 7) Convergent, 8) Convergent, 9) Divergent, 10) Divergent.