

Calculus

Direct & Limit Comparison Tests

(Q1.) Which of the followings are **convergent**? No need to show work.

(A) $\sum_{n=1}^{\infty} \frac{1}{n!}$

(B) $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n^2}}$

(C) $\sum_{n=1}^{\infty} \frac{1}{n^n}$

(D) $\sum_{n=1}^{\infty} \frac{1}{3^n}$

(E) $\sum_{n=1}^{\infty} \frac{1}{\ln n}$

(F) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+1}}$

(G) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3}}$

(H) $\sum_{n=1}^{\infty} \frac{1}{(0.8)^n}$

(I) $\sum_{n=2}^{\infty} \frac{\ln n}{n}$

(J) $\sum_{n=1}^{\infty} \frac{n!}{10^n}$

(Q2.) to (Q15.) Determine whether the following series converge or not. Justify your answers

(Q2.) $\frac{1}{4} + \frac{1}{7} + \frac{1}{10} + \frac{1}{13} + \frac{1}{16} + \dots$

(Q3.) $\frac{1}{3} + \frac{1}{6} + \frac{1}{11} + \frac{1}{18} + \frac{1}{27} + \dots$

(Q4.) $1 + \frac{2}{9} + \frac{3}{25} + \frac{4}{49} + \frac{5}{81} + \dots$

(Q5.) $\sum_{n=1}^{\infty} \sin\left(\frac{1}{\sqrt{n}}\right)$

(Q6.) $\sum_{n=1}^{\infty} \cos\left(\frac{1}{n^2}\right)$

(Q7.) $\sum_{n=1}^{\infty} \sin^3\left(\frac{1}{n}\right)$

(Q8.) $\sum_{n=2}^{\infty} \frac{\ln n}{n^2}$, hint: $\ln n \ll \sqrt{n}$ for all n

(Q9.) $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n} \ln n}$, hint: $\ln n \ll \sqrt{n}$ for all n

(Q10.) $\sum_{n=1}^{\infty} \frac{n^3 + 1}{n^4 + 1}$

(Q11.) $\sum_{n=1}^{\infty} \frac{3n+1}{\sqrt{n^5 + 4n^2 + 12}}$

(Q12.) $\sum_{n=1}^{\infty} (\sqrt[n]{e} - 1)$

(Q13.) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{4^n + 1}}$

(Q14.) $\sum_{n=1}^{\infty} \left(\frac{1}{\sqrt{n}} - \frac{1}{n+1} \right)$

(Q15.) $\sum_{n=1}^{\infty} \left(\frac{1}{\sqrt{n}} - \frac{1}{\sqrt{n+1}} \right)$