

Q-2-a) Check the following series for converge:

$$\sum_{n=1}^{\infty} \frac{\sin n + n + \ln n}{(22n^2 + 6n + 2010)}$$

Solution: We limit-compare this series with the Harmonic series.

$$\lim_{n \rightarrow \infty} \frac{\frac{\sin n + n + \ln n}{(22n^2 + 6n + 2010)}}{\frac{1}{n}} = \lim_{n \rightarrow \infty} \frac{n \sin n + n^2 + n \ln n}{22n^2 + 6n + 2010} = \lim_{n \rightarrow \infty} \frac{\frac{\sin n}{n} + 1 + \frac{\ln n}{n}}{22 + \frac{6}{n} + \frac{2010}{n^2}} = \frac{1}{22} < \infty.$$

Since the Harmonic series diverges, our series also diverges by the Limit Comparison Test.