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

$$\sum_{n=1}^{\infty} \frac{\ln n}{(19n^2 + 6n + 2008)}$$

Solution:

Limit compare with $\sum \frac{\ln n}{n^2}$ which converges by the integral test, to conclude that the given series converges.

Use integration by parts to integrate $\frac{\ln x}{x^2}$ as follows: Set $u = \ln x$ and then

$$\int_1^{\infty} \frac{\ln x}{x^2}\, dx = -\left(\frac{\ln x}{x}\Big|_1^{\infty}\right) + \int_1^{\infty} \frac{dx}{x^2} = -\left(\frac{1}{x}\Big|_1^{\infty}\right) = 1.$$