(1) Determine whether the series converges or diverges. (10pts)
(a) \[ \sum_{k=1}^{\infty} \ln\left( \frac{2k}{7k-5} \right) \]

(b) \[ \sum_{k=1}^{\infty} \frac{k^3}{5^k} \]
(2) (a) Use the ratio test to determine whether the series \( \sum_{k=1}^{\infty} \tan \left( \frac{1}{\sqrt{k}} \right) \) converges or diverges. (10pts)

(b) Use the limit comparison test to determine whether the series \( \sum_{k=0}^{\infty} \frac{k}{k^3 + k + \sqrt{k}} \) converges or diverges. (5pts)
(3) (a) Determine if the series $\sum_{k=1}^{\infty} (-1)^k \ln(1 + \frac{1}{k})$ is absolutely convergent, conditionally convergent, or divergent. (15pts)
(4) Determine the radius of convergence and the interval of convergence of \( \sum_{k=1}^{\infty} \frac{(x-5)^k}{k^2} \). (15pts)
(a) Find the Taylor series for \( f(x) = \ln x \) at \( x_0 = 2 \). (10pts)

(b) Solve any one of the following: (10pts)

(i) Find the Maclaurin series for \( \tan^{-1}x \).

(ii) Write the first three terms of the power series representing the function \( \frac{\cos x}{1-x^2} \).