1. For each of the following series, determine whether they converge absolutely, converge conditionally, or diverge. You must state which test(s) you are using, and show that you have checked all appropriate conditions.

(a) \[ \sum_{n=1}^{\infty} \frac{\sqrt{15 - 3n + 5n^4}}{2n^4 + 13} \]

(b) \[ \sum_{n=1}^{\infty} \frac{3 + \cos n^2}{\sqrt{n}} \]

(c) \[ \sum_{n=1}^{\infty} \frac{5^n n! n! n!}{(3n)!} \]
(d) \[ \sum_{n=2}^{\infty} \frac{1}{n(\ln n)^{3/2}} \]

(e) \[ \sum_{n=1}^{\infty} \left( \frac{\sqrt{3n^4 + 17}}{2n^2 + 11} \right)^n \]

(f) \[ \sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^{\pi/3.15}} \]

(g) \[ \sum_{n=1}^{\infty} \frac{(-3)^n + 6}{2^n + 9} \]
2. The first two terms of a geometric series are 4 and $\frac{2}{3}$. Find the sum of the series.

3. Find the centre, radius of convergence and interval of convergence for the power series $\sum_{n=0}^{\infty} \frac{(4 - 5x)^n}{\sqrt{n + 1}}$.

4. (a) Find the first 3 non-zero terms in the Maclaurin expansion for $e^{-x} + \sin x$.

(b) Find the interval of convergence of this Maclaurin series.
5. (a) Use the Maclaurin series for \( \ln(1 + x) \) to write a simplified power series for \( \frac{\ln(1 + x)}{x} \).

(b) Use your power series to write \( \int_0^1 \frac{\ln(1 + x)}{x} \, dx \) as a series.

6. Suppose that \( f(x) = \sum_{n=0}^{\infty} \frac{2^n - n^2}{(2n)!} (x - 2)^n \).

Find \( f(2) \), \( f'(2) \), \( f''(2) \) and \( f^{(35)}(2) \).