1. Determine if the following series converges or diverges. If it converges find its sum. Fully justify your answer.

$$\sum_{n=0}^{\infty} \frac{1}{n^2+5n+6}.$$

2. Suppose $f : (-R, R) \to \mathbb{R}$ is infinitely differentiable and for each j there is an M_j such that $|f^{(j)}(t)| \leq M_j$ for each $t \in (-R, R)$. Show if

$$\sum_{j=0}^{\infty} M_j \frac{R^j}{j!}$$

converges, then the Taylor series for f converges to f uniformly on $(-R, R)$.

3. Determine if the following series converge.

a) $\sum_{n=2}^{\infty} \frac{1}{n(\log(n))^p}$

b) $\sum_{n=1}^{\infty} 9^{-n+2}4^{n+1}$

4. Show if (a_n) is a sequence of non-zero real numbers and

$$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right|$$

converges to limit L then the radius of convergence of $\sum a_j x^j$ is $R = \frac{1}{L}$.