Math 1497 - Calculus II
Sample Test 2

1. Do the following converge (explain)?

$$\sum_{n=1}^{\infty} \frac{\ln n}{n^4+1}, \quad \sum_{n=1}^{\infty} \frac{1}{n^3+1}, \quad \sum_{n=1}^{\infty} \left(\frac{1}{2}+\frac{1}{n}\right)^n, \quad \sum_{n=1}^{\infty} \frac{e^n}{n!}, \quad \sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^2}, \quad \sum_{n=1}^{\infty} \frac{1}{\ln(n+1)},$$

$$\sum_{n=1}^{\infty} \frac{1}{n(n+1)}, \quad \sum_{n=1}^{\infty} \frac{n-1}{n+1}, \quad \sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^2}, \quad \sum_{n=2}^{\infty} \frac{1}{\ln^2(n)}, \quad \sum_{n=3}^{\infty} \frac{1}{n\ln n}, \quad \sum_{n=1}^{\infty} \frac{1}{2^n+1}.$$

2. Determine whether the following series converge absolutely, conditionally or diverge

$$\sum_{n=1}^{\infty} \frac{(-1)^n(n-1)}{n+1}, \quad \sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n(n+1)}}, \quad \sum_{n=1}^{\infty} \frac{(-1)^n n^n}{n!},$$

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{2^n+3^n}, \quad \sum_{n=1}^{\infty} \frac{(-1)^n n}{n^2+1}, \quad \sum_{n=1}^{\infty} \frac{(-1)^n n}{n+1},$$

3. Determine the interval of convergence of the following

$$\sum_{n=1}^{\infty} \frac{2^n x^n}{\sqrt{n+1}}, \quad \sum_{n=1}^{\infty} \frac{(-1)^n x^{2n}}{2^{2n}(n!)^2}, \quad \sum_{n=1}^{\infty} \frac{(2x-1)^n}{n^2},$$

4. Calculate the n^{th} degree Taylor polynomial for the following (the center c is given) and give the remainder.

$$\begin{array}{ll}
(i) & f(x) = e^x, \quad c = 0 \quad n = 2 \\
(ii) & f(x) = \sin x, \quad c = \dfrac{\pi}{2}, \quad n = 4 \\
(iii) & f(x) = \ln(x+1), \quad c = 0, \quad n = 3 \\
(iv) & f(x) = \dfrac{1}{2-x}, \quad c = 0, \quad n = 3.
\end{array}$$