Math 251 Sample Test One

Determine if each of the following series is convergent or divergent.

1. $\sum_{n=1}^{\infty} \frac{n}{n^3+1}$ 2. $\sum_{n=1}^{\infty} \frac{2^n}{5^n-1}$

   (Use Direct Comparison Test or Limit Comparison Test)

3. $\sum_{n=1}^{\infty} \frac{(-1)^n\sqrt{n}}{n^2+1}$ 4. $\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$.

   (Use the Alternating Series Test)

5. Determine whether the series $\sum_{n=1}^{\infty} \frac{n^2}{n^2+1}$ is convergent or divergent.

6. Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n+4}}$ conveges conditionally or absolutely, or diverges.

7. Find the radius of convergence and interval of convergence of series of the following series:

   (1) $\sum_{n=1}^{\infty} \frac{2^n(x-2)^n}{n!}$ (2) $\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{n^2 5^n}$.

8. Find the Taylor Polynomials $P_1(x)$, $P_2(x)$, $P_3(x)$ for function $f(x) = \sin x$ centered at $c = \frac{\pi}{2}$.

9. Find the 3rd order Maclaurin Polynomial of function $f(x) = e^{5x}$.

10. Find the value of the summation by showing that the series telescopes.

    A) $\sum_{n=1}^{\infty} \left(\frac{1}{n} - \frac{1}{n+2}\right)$ B) $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$ **Hint: Use Partial Fractions**