Test 3 Calculus II 3450:222 April 14, 2006
Show all of your work.

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) $\displaystyle\sum_{n=1}^{\infty} \frac{5 - 2n + 6n^2}{\sqrt{5n^8 + n^6 + 7}}$

7 points

   (b) $\displaystyle\sum_{n=2}^{\infty} \frac{(-1)^n}{n^2 \ln n}$

7 points

   (c) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n (3n)!}{(2n)! n!}$

7 points

(d) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

7 points

(e) $\displaystyle\sum_{n=1}^{\infty} \left(\frac{1-3n}{5n+1}\right)^n$

7 points

(f) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{n}}$

7 points

(g) $\displaystyle\sum_{n=1}^{\infty} (-1)^n \frac{n}{2n + (0.5)^n}$

7 points

2. Use a geometric series to write $2.74\ 74\ 74\ \cdots$ as a rational number.

10 points

3. Find the *centre*, *radius of convergence* and *interval of convergence* for the power series $\displaystyle\sum_{n=0}^{\infty} \frac{(3-2x)^n}{4^n+1}$.

11 points

4. (a) Write the Maclaurin series for $\cos x$.

5 points

(b) Use your series above to write a simplified power series for $\cos\sqrt{x}$.

5 points

(c) Use your power series to write $\int_0^1 \cos\sqrt{x}\ dx$ as a series.

5 points

5. Suppose that $f(x) = \sum_{n=0}^{\infty} \frac{2 - \sin^2 n!}{4^n}(x-2)^n$.

   Find $f(2)$, $f'(2)$ and $f^{(13)}(2)$.

5 points

6. Find the first 3 non-zero terms of the Maclaurin expansion for $g(x) = \ln(1+x) + e^x$.

10 points