

**Exam 4    Calc 2    4/18/2008**

Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Find the first 3 partial sums for the series  $\sum_{n=1}^{\infty} \frac{1}{n}$ .

2. Give an example of a series which converges, but does not converge absolutely.

3. Determine whether  $\sum_{n=1}^{\infty} \frac{3n}{n^3 + 1}$  converges or diverges.

4. Determine whether  $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln n}}$  converges or diverges.

5. Find the radius of convergence of the series  $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}$ .

6. Find a power series, in sigma notation, for  $f(x) = \frac{1}{1+x^3}$ .

7. Bunny is a calculus student at Enormous State University, and she's having some trouble. Bunny says "Ohmygod, this is *so* unfair. Our professor was talking about this thing, like, with a lion chasing a guy around in this arena, right? And he wrote all this stuff on the board, and I didn't understand *any* of it, but at the end, like, there was one of those sigma things and one over  $n$  to the three-quarters. But so then he said we had to know what that was for our test, because, like, it was how far the guy could run before the lion would eat him. But he also told us the day before that pretty much the only of those sigma things where we could actually say what they added up to were the geometric ones, and I don't think this is like that. So how am I ever going to pass this test?"

Help Bunny by explaining to her what the series she mentions tells her about the man's life expectancy.

8. Find the 3<sup>rd</sup> degree Maclaurin Polynomial for  $f(x) = \tan x$ .

9. Determine whether  $x = \frac{1}{2}$  is included in the interval of convergence of the series  $\sum_{n=1}^{\infty} (-1)^n \frac{2^n x^n}{n^2}$ .

10. Find the interval of convergence of the series  $\sum_{n=1}^{\infty} \frac{2 \cdot 4 \cdot 6 \cdot \dots \cdot (2n)}{1 \cdot 3 \cdot 5 \cdot \dots \cdot (2n-1)} x^n$ .

Extra Credit (5 points possible):

Evaluate  $\sum_{n=1}^{2007} \frac{5^{2008}}{25^n + 5^{2008}}$ .