Problem Set 5 Calculus 2 Due 3/4/2005

You are encouraged to work in groups of two to four on this assignment and make a single group submission. Each problem is worth 5 points. For full credit indicate clearly how you reached your answer. All work must be legible and submitted on clean paper without ragged edges.

1. a) Find the first 6 partial sums for the series $\sum_{n=1}^{\infty} \frac{1}{n}$ (this is called the **harmonic series**).

b) Find the 10^{th}, 100^{th}, and 1000^{th} partial sums for the series from part a. Does it appear to converge to any finite value?

c) Find the first 6 partial sums for the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n}$ (this is called the **alternating harmonic series**).

d) Find the 10^{th}, 100^{th}, and 1000^{th} partial sums for the series from part c. Does it appear to converge to any finite value?

2. a) Find the first 6 partial sums for the series $\sum_{n=0}^{\infty} \frac{1}{n!}$.

b) Find the 10^{th}, 100^{th}, and 1000^{th} partial sums for the series from part a. Does it appear to converge to any finite value?

3. a) Find the first 6 partial sums for the series $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$.

b) Do the partial sums converge to a finite value? Justify your answer carefully. [Hint: partial fractions!]

4. Suppose that you have a large supply of books, all the same size, and you stack them at the edge of a table, with each book extending farther beyond the edge of the table than the one beneath it. Show that it is possible to do this so that the top book extends entirely beyond the edge of the table. In fact, show that the top book can extend any distance at all beyond the edge of the table if the stack is high enough. Use the following method of stacking: The top book extends half its length beyond the second book. The second book extends a quarter of its length beyond the third. The third extends one-sixth of its length beyond the fourth, and so on. (Try it yourself with a deck of cards.) Consider centers of

mass.[1]

[1]Borrowed verbatim from Stewart's *Calculus*, 4th ed.