MA 225 **Problem Session 2**

Name: ____________________

1. (a) Is the series $1 - y^2 + y^4 - y^6 + \cdots$ a geometric series for a fixed value of y? Identify the constant term and the ratio.

(b) Write the series in sigma notation.

(c) For which values of y is the series convergent? Find the sum of the series for those values.

2. A ball is dropped from the height of 10 feet and bounces. Each bounce is $\frac{3}{4}$ of the height of the bounce before. Thus, after the ball hits the floor for the first time, the ball rises to the height of $10(\frac{3}{4}) = 7.5$ feet, and after it hits the floor the second time it rises to the height of $7.5(\frac{3}{4}) = 10(\frac{3}{4})^2 = 5.625$ feet. (Assume there is no air resistance.)

(a) Find an expression for the total vertical distance the ball has traveled when it hits the floor for the n^{th} time. Express your answer in closed form.

(b) Use your answer to part (a) to find the approximate total vertical distance the ball travels in the long run.

3. Test each series for convergence/divergence.

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

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{\sin^4 n}{n^3}$.

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

(d) $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^n}{\sqrt{3n+2}}$

4. Sum of a telescoping series. Here, we find the sum of the telescoping series: $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$.

(a) Recall from Calculus 1 that one can use partial fractions to rewrite:

$$\frac{1}{n(n+1)} = \frac{1}{n} - \frac{1}{n+1}$$

Now, write the first few partial sums, s_1, s_2, and s_3 using the above identity. Notice the cancellations.

(b) Find a formula for s_n.

(c) Find $\displaystyle\sum_{n=1}^{\infty} \frac{1}{n(n+1)} = \lim_{n\to\infty} s_n$