**Math 175 – Review Questions for Exam 3**

**1.** Write a formula for the $n$th term of the sequence $6, -3, 3/2, -3/4, 3/8, -3/16, \ldots$

**2.** For each sequence below, either find the limit or show that the limit does not exist. Be sure to justify your answer.

$$\left\{\frac{(-1)^n n}{3n+2}\right\} \qquad \left\{\frac{\sin(n)}{n+\cos(n)}\right\}$$

**3.** Write the first four terms of the sequence of partial sums for the series $\displaystyle\sum_{k=1}^{\infty} \frac{2k}{k^2+1}$.

**4.** Find the sums of the following geometric series (if they converge).

$$5 - 5/3 + 5/9 - 5/27 + 5/81 - \cdots \qquad \sum_{k=2}^{\infty} \frac{3^k}{2^{2k}}$$

**5.** Find the sum of the series $\displaystyle\sum_{k=1}^{\infty} \left(\frac{1}{2k+1} - \frac{1}{2k+3}\right)$ if it converges.

**6.** Use the Integral Test to determine if the following series converge or diverge:

$$\sum_{k=1}^{\infty} \frac{k}{(k^2+1)^2} \qquad \sum_{k=1}^{\infty} \frac{1}{\sqrt{k+3}}$$

**7.** Use the Ratio Test or Root Test to determine if the following series converge or diverge:

$$\sum_{k=1}^{\infty} \frac{3^{k+1}}{k!} \qquad \sum_{k=1}^{\infty} \left(\frac{2k+1}{3k-5}\right)^k$$

**8.** Use the Limit Test or Limit Comparison Test to determine if the following series converge or diverge:

$$\sum_{k=1}^{\infty} \frac{1}{k^3+\ln(k)} \qquad \sum_{k=1}^{\infty} \frac{k}{k^2+1}$$

**9.** Use any of the series convergence tests to determine whether these series converge or diverge:

$$\sum_{k=2}^{\infty} \frac{6}{(k^2-1)} \qquad \sum_{k=1}^{\infty} \frac{(-1)^k}{2k+5} \qquad \sum_{k=1}^{\infty} \frac{5k^2-4k+2}{3k^2+\ln(k)}$$

**10.** For the second series in problem 9, how large do we need to make $n$ so that the $n$th partial sum $S_n$ is within $10^{-3}$ of the actual sum for the series?