Section 10.1

1. Find the limit of the following sequences, if it exists. If the sequence diverges, state why.

a.) $a_n = \dfrac{n}{\sqrt{n+2}}$

b.) $a_n = \ln(n) - \ln(3n+1)$

c.) $a_n = \dfrac{(-1)^n n}{n^2+1}$

d.) $a_n = \dfrac{(-1)^n n^2}{n^2+1}$

e.) $a_n = \dfrac{\ln n}{n}$

2. Suppose $\{a_n\}$ was given to be a convergent sequence, $a_1 = 2$, and $a_{n+1} = \dfrac{1}{3 - a_n}$, find:

a.) a_4

b.) the limit of the sequence.

3. Determine whether the following sequences are increasing, decreasing, or non monotonic.

a.) $a_n = \frac{1}{n^5}$

b.) $a_n = \frac{\ln n}{n}$

c.) $a_n = \cos(n\pi)$

4. Determine whether the following sequences are bounded.

a.) $a_n = \left\{ \frac{1}{n^2} \right\}_{n=1}^{\infty}$

b.) $a_n = \left\{ \frac{n^2}{n+1} \right\}_{n=1}^{\infty}$

Section 10.2

5. Find the first few partial sums of the series $\sum_{n=1}^{\infty} \frac{1}{n}$ and $\sum_{n=1}^{\infty} \frac{1}{n^2}$. Try to determine whether they converge/diverge.

6. Suppose $\sum_{n=1}^{\infty} a_n$ is a convergent series and $s_n = 5 + \dfrac{n}{2n+3}$ is a formula for the nth partial sum. What is the sum of the series?

7. Find the sum of the following series. If it diverges, support your answer.

a.) $\sum_{n=1}^{\infty} \left(\frac{1}{n+5} - \frac{1}{n+6} \right)$

b.) $\sum_{n=2}^{\infty} \ln\left(\frac{n}{n+1}\right)$

c.) $\sum_{n=1}^{\infty} 2\left(\frac{1}{7}\right)^{n-1}$

d.) $\sum_{n=1}^{\infty}(-5)\left(\frac{2}{3}\right)^{n}$

e.) $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n + 3^n}{5^n}$

f.) $\sum_{n=2}^{\infty} \frac{(-1)^n 2^n}{3^{n+1}}$

g.) $\sum_{n=0}^{\infty} \frac{(-1)^n 3^{2n}}{7^{n+1}}$

h.) $\mathbf{4 + \frac{8}{5} + \frac{16}{25} + \frac{32}{125} + ...}$