NAMES:

1. Use comparison tests to determine if the series converge or diverge.

a) $\displaystyle\sum_{n=3}^{\infty} \frac{1}{3n+4}$

b) $\displaystyle\sum_{n=1}^{\infty} \frac{1+\cos n}{2^n}$

2. a) Use the graph of $y = \frac{1}{x}$ to show that if s_n is the n^{th} partial sum of the harmonic series, then $s_n \leq 1 + \ln n$.

b) The harmonic series diverges very slowly. Use part a and a calculator to find a upper bounds for the one millionth partial sum ($s^{1,000,000}$) and the one billionth partial sum ($s_{1,000,000,000}$).

3. Consider the series $\sum_{n=1}^{\infty} (-1)^{n-1} \frac{1}{n}$. Calculate the first 6 partial sums of the series $(s_1, s_2, \ldots, s_6)$ and plot them on the number line below (ticks are marked at every $\frac{1}{60}$). Do you notice a pattern? Can you use this pattern to argue that the series must converge?