MA 355 Homework 5

#1 Use the definition of convergence to show $lim_{n\to\infty}\frac{3n+1}{n+2} = 3$.

2 Show $\lim_{n\to\infty}\frac{\sqrt{n}}{n+1} = 0$.

3 Determine is the following sequences diverge or converge (as $n \to \infty$). Find any limits that exist. Support your answers.

- $s_n = \frac{3-2n}{1+n}$.
- $s_n = \frac{(-1)^n n}{2n-1}$.
- $s_n = \sqrt{n^2+n} - n$

4 a) Give an example of a convergent sequence $\{s_n\}$ of positive numbers such that $\lim_{n\to\infty}\frac{s_{n+1}}{s_n} = 1$.
b) Give an example of a divergent sequence $\{s_n\}$ of positive numbers such that $\lim_{n\to\infty}\frac{s_{n+1}}{s_n} = 1$.

5 Suppose $\{s_n\}$ and $\{t_n\}$ are real sequences and $\lim_{n\to\infty} s_n = s$. Show $\lim ks_n = ks$ and $\lim(k + s_n) = k + s$ for all $k \in \mathbb{R}$.

6 Prove that if $\{s_n\}$ converges then $\{|s_n|\}$ converges.

7 Suppose there exists N_0 such that $s_n \leq t_n$ for all $n > N_0$. Prove that if $\lim s_n = +\infty$, then $\lim t_n = +\infty$.

8 Show $\lim n^2 = +\infty$.