Math 112 Group problems, Monday Week 9

PROBLEM 1. Find the limit of the sequence $\left\{\frac{3n^2-5}{n^2-3n+2}\right\}$ using our limit theorems (i.e., without using an ε-N argument). Justify each step.

PROBLEM 2. We have shown that $\lim_{n\to\infty} \frac{\sin(n)}{n} = 0$. Use this result along with our limit theorems to find the limit of the sequence $\left\{\frac{\sin(n)}{n^2-n+1}\right\}$ justifying each step.

PROBLEM 3. State whether each of the following statements is true or false (with proof or concrete counterexample):

(a) If $\{a_n\}$ and $\{b_n\}$ both diverge, then $\{a_n + b_n\}$ diverges.

(b) If $\{a_n\}$ converges and $\{b_n\}$ diverges, then $\{a_n + b_n\}$ diverges.

PROBLEM 4. Let $k \in \mathbb{N}_{>0}$. Find, with proof, the limit of the sequence $\left\{\left(\frac{n+1}{n}\right)^k\right\}$.

PROBLEM 5. Suppose that $\lim_{n\to\infty} s_n = s$ and $\lim_{n\to\infty} t_n = t$. Review the proof that

$$\lim_{n\to\infty} (s_n + t_n) = s + t.$$