# Warm-Up Problems and Lecture Problems
# March 28, 2003

1. Some properties of sequences are listed below. Determine which properties, if any, the sequences satisfy.

   - **Increasing:** $a_{n+1} \geq a_n$ for all $n$. (i.e., the terms increase.)
   - **Decreasing:** $a_{n+1} \leq a_n$ for all $n$. (i.e., the terms decrease.)
   - **Monotonic:** The sequence is either increasing or decreasing.
   - **Bounded above:** There is a number $M$ such that $a_n \leq M$ for all $n$. (i.e., the sequence is always below a certain number.)
   - **Bounded below:** There is a number $M$ such that $a_n \leq M$ for all $n$. (i.e., the sequence is always above a certain number.)
   - **Bounded:** The sequence is bounded above and bounded below.

   (a) $1, 2, 3, 4, \ldots$

   (b) $-1, -2, -3, \ldots$

   (c) $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1,5}{,} \ldots$

   (d) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots$

   (e) $-\frac{1}{2}, \frac{2}{3}, -\frac{3}{4}, \frac{4}{5}, \ldots$

   (f) $2, 2, 2, 2, 2, \ldots$

   (g) $1, -2, 3, -4, 5, -6, \ldots$

   (h) $1, \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}, \ldots$

   (i) $-1, \frac{1}{2}, -\frac{1}{4}, \frac{1}{8}, -\frac{1}{16}, \frac{1}{32}, \ldots$

   If you have time, determine the limit of the above sequences and see if you can find a general formula for the $n$-th term of the sequence.