Computer Science 341
Discrete Mathematics

Problem Session 1
September 23, 2002

Problem 1
Prove that if $x \geq -1$, then for any integer $n \geq 0$, $(1+x)^n > nx$.

Problem 2
Use induction to prove that for any $n \geq 1$, $2^{2^n} + 3^{2^n} + 5^{2^n}$ is divisible by 19.

Problem 3
Show that every sequence of $n^2 + 1$ distinct numbers has either an increasing sequence of length $n+1$ or a decreasing sequence of length $n+1$.

Problem 4
Prove that n straight lines in general position divide the plane into exactly $n(n+1)/2 + 1$ regions. (A set of lines is said to be in *general position* if the intersection of every pair of lines is a single point and no two pairs have the same intersection.)

Problem 5
Prove that any amount greater than 7 cents can be paid exactly with 5-cent and 3-cent coins only.