Due at the start of class Tuesday, November 22, 2005 (or Tuesday, November 29).

**Problem 1.**

a. Give a Turing Machine that takes as input two binary integers, separated by a comma, decides if the first integer is larger. If it is larger the machine should print “Y”, otherwise it should print “N”, on an otherwise blank tape.

b. Give a Turing Machine that takes as input two binary integers, separated by a comma, and prints the larger one on an otherwise blank tape.

**Problem 2.**

a. Give a Turing Machine that takes as input a string \(w \in \{a, b\}^*\) and prints out \(w^R\).

b. Give a Turing Machine that takes as input a string \(w \in \{a, b\}^*\) and prints “Y” if \(w = w^R\) and prints “N” if \(w \neq w^R\).

**Problem 3.**

a. Give a primitive recursive function that takes as input two numbers, decides if the first number is larger. If it is, the value should be 1; otherwise the value should be 0.

b. Give a primitive recursive function that takes as input two numbers, returns the larger of the two numbers. In other words, the function should return \(\max(m, n)\).

**Problem 4.** Show that \(\text{prime}(n)\) is primitive recursive, where \(\text{prime}(n) = 1\) if \(n\) is prime, and \(\text{prime}(n) = 0\) if \(n\) is not prime.