V63.0233 Homework 7
due MONDAY, Oct. 23, 2006

• Ch. 3 P 58, 74, 87, 88
• Ch. 4 P 1, 2, 5, 17

A. Suppose we flip a biased coin infinitely many times. Let \( n > 0 \) be an integer, and let \( E \) be the event that a run of \( n \) consecutive heads occurs eventually. Let’s denote \( P(\text{heads}) \) by \( p \).

(i) Let \( T \) denote the event that the first flip is tails. How are \( P(E) \) and \( P(E|T) \) related?

(ii) Let \( H \) denote the event that the first flip is heads. Derive an equation relating \( P(E|H), P(E), \) and \( p \).

(iii) Calculate \( P(E) \). (Is this surprising? What if \( n \) is very large, say a million or a googol (\( 10^{100} \))?)