Collected Definitions Since Exam #3

Here are the definitions that we’ve covered since the material for the last midterm exam. I’m not going to re-print all of the definitions for the whole semester – if you lost a previous exam’s definition handout, you can print another from the class web page.

**Topic 13: Counting**

- An ordering of \( n \) distinct elements is called a **permutation**.
- An ordering of an \( r \)-element subset of \( n \) distinct elements is called an **\( r \)-Permutation**.
- An \( r \)-Combination of an \( n \)-element set \( X \) is an \( r \)-element subset of \( X \). The quantity of \( r \)-element subsets is denoted \( C(n, r) \) or \( \binom{n}{r} \), and is read “\( n \) choose \( r \).”

**Topic 14: Algorithms**

- An **algorithm** is a finite set of instructions for performing a task.
- A recursive definition has two (sometimes three) parts:
  1. The basis clause determines how trivial cases are to be handled.
  2. The inductive clause explains how complex problems are answered in terms of simpler versions of the same problem.
  3. The extremal clause says that only cases covered by the basis and inductive clauses are covered by the recursive definition. That is, the extremal clause provides boundaries for the definition.
- A recursive algorithm expresses the solution to a task in terms of a simpler case of the same problem.
- The **factorial** of a non-negative integer \( n \), denoted \( n! \), is the product of all integer values from 1 through \( n \), inclusive. By definition, \( 0! = 1 \).
- The \( n^{th} \) term of the **Fibonacci sequence** is the sum of terms \( n-1 \) and \( n-2 \), where \( F(0) = 0 \) and \( F(1) = 1 \).

**Topic 15: Recurrence Relations**

- A recurrence relation for the sequence \( a_0, a_1, \ldots \) is an equation that expresses term \( a_k \) in terms of one or more of its preceding sequence members, one of more of which are explicitly stated initial conditions of the sequence.
- A linear homogeneous recurrence relation with constant coefficients of degree (or order) \( k \) (abbreviated: LHRRWCC of degree \( k \)) has the form \( R(n) = c_1R(n-1) + c_2R(n-2) + \ldots + c_kR(n-k) \), where \( c_i \in \mathbb{R} \) and \( c_k \neq 0 \).

**Topic 16: Finite Probability**

- The **probability** that a specific event will occur is the ratio of the number of occurrences of interest to the number of possible occurrences.

**NOTE:** The next two definitions are included just in case I have time in lecture to talk about them. If I don’t cover them in class, you don’t have to know them.

- Let \( X \) and \( Y \) be events. The conditional probability of \( X \) given \( Y \), denoted \( p(X|Y) \), is \( \frac{p(X \cap Y)}{p(Y)} \).
- If \( p(A|B) = p(A) \), then the events \( A \) and \( B \) are **independent**.