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 or D2L.

**Topic 13: Counting**  
[This is a partial Topic 13 list; see the Exam #3 definition collection for the rest.]

- A *combinatorial proof* is an argument based on the principles of counting.

**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 $R(n) = c_1 R(n-1) + c_2 R(n-2) + \ldots + c_k R(n-k)$, 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*. 