Statistics 150, Spring 2001: Additional keywords for final exam.

The exam will cover all the material through chapter VI (except VI.5 and VI.7) and VIII.1,2,4 of Taylor and Karlin, and the additional material on martingales. You are expected to be fluent in all of the material from Statistics 101 or 134. The best way to study is to do exercises from the book and make sure you understand the solutions to all of the homework problems. Homework problems will reappear, in slightly altered form, on the exam. What follows is a list of keywords, in no particular order, to guide your review for the exam.

The review session will be on Tuesday, May 15, 4-6pm. The room will be posted on 347 Evans.

(1) Conditional probability
  (a) Law of total probability
  (b) Bayes' Theorem
(2) Tail bounds (Markov's ineq., Chebyshev's)
(3) Martingales
  (a) Martingale limit theorem
  (b) stopping time
  (c) Optional stopping theorem (i.e., $E[X_T] = E[X_0]$ when T is a stopping time with finite expectation.)
(4) sums of i.i.d. random variables
  (a) Law of large numbers
  (b) Central limit theorem
  (c) exponential inequality
(5) Markov chains
  (a) transition matrix
  (b) first-step analysis
  (c) absorbing states
  (d) regular, irreducible, aperiodic
  (e) stationary distribution: limit theorem
  (f) transient, recurrent (null, positive)
  (g) multistep Markov process
  (h) Galton-Watson branching process
(6) generating functions
  (a) sums of independent variables
  (b) sums of random numbers of variables
  (c) expectations, $P(X = 0)$, etc.
(7) Poisson process
  (a) law of rare events
  (b) hazard rates
  (c) Exponential waiting times, gamma distribution
  (d) conditioning on number of hits
  (e) spatial Poisson process
  (f) examples: shot noise, sum-quota sampling
  (g) compound Poisson process
  (h) example: crack failure

(8) Continuous-time, discrete-space Markov chains
  (a) Chapman-Kolmogorov Equations
  (b) Birth-death processes
  (c) Examples: Yule process, Linear death process, linear growth with immigration
  (d) sojourn times
  (e) limit distributions
(9) Brownian motion
  (a) Invariance principle (convergence of random walks)
  (b) Standard normal distribution, central limit theorem
  (c) Gaussian processes, multivariate normal, covariance structure of Brownian motion
  (d) zeroes of Brownian motion
  (e) Reflection principle
  (f) Brownian motion with drift
  (g) Geometric Brownian motion, computing hitting probabilities for BM with drift
  (h) Hitting times for BM with drift