

**Topics for Exam 3****1. Joint Distributions**

- 1.1 Joint distribution of two random variables
- 1.2 Marginal distributions
- 1.3 Independent random variables

**2. Limiting Distributions**

- 2.1 The Poisson distribution as a limit of binomial distributions.
- 2.2 Convergence in distribution
- 2.3 The mgf convergence theorem
- 2.4 The central limit theorem
- 2.5 Convergence in probability
- 2.6 The weak law of large numbers

**Relevant sections in the online class notes:** 5.3.2, 6.1, 6.2, 6.3, 7.1, 7.2, 8.1, 8.2, 8.3, 9.1 and 9.2.

**Relevant sections in the text:** 3.4, 3.5, 3.9, 4.8, 5.4, 5.6 and 6.2.

**Relevant assignments:** 13, 14, 15, 16, 17, 18, 19 and 20.

**Important concepts:** Joint distributions; marginal distributions; independent random variables; independent, identically distributed (iid) random variables; convergence in distribution; the mgf convergence theorem; the central limit theorem; convergence in probability; the weak law of large numbers; Markov's inequality; Chebyshev's inequality.

**Some Special Distributions.**

Discrete random variables: discrete uniform, Bernoulli, binomial, geometric, hypergeometric, Poisson.

Continuous random variables: Uniform, exponential, normal, chi-square and gamma.

**Important skills:** Know how to compute the joint cdf and the joint pdf (or pmf) of two random variables; Know how to compute marginal distributions; know how to compute probabilities using joint distributions; know how to use independence; know how to determine whether random variables are independent; know how to apply the uniqueness theorem for moment generating functions; know how to apply the mgf convergence theorem to compute limiting distributions; know how to apply the central limit theorem; know how to apply the Markov and Chebyshev inequalities.