1. Formulas

The following formulas will be written on the exam. A statistics calculator is required. You will be given $z$-tables to use for the exam. Exam 2 is scheduled for Thursday, March 31.

1.1. Specific Distributions.

- **Binomial**
  
  $$b(x; n, p) = \binom{n}{x} p^x (1-p)^{n-x} \quad x = 0, 1, 2, \ldots, n$$

- **Hypergeometric**
  
  $$h(x; n, M, N) = \frac{\binom{M}{x} \binom{N-M}{n-x}}{\binom{N}{n}} \max\{0, n-N+M\} \leq x \leq \min\{n, M\}$$

- **Geometric**
  
  $$nb(x; 1, p) = (1-p)^{x-1} p \quad x = 0, 1, 2, \ldots$$

- **Exponential**
  
  $$f(x) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

1.2. General Formulas for Discrete Distributions:

- **Expected Value**
  
  $$\mu_X = \sum_x x P[X = x]$$

- **Variance**
  
  $$\sigma_X^2 = \sum_x (x - \mu_X)^2 P[X = x]$$

1.3. General Formulas for Continuous Distributions. For continuous probability distributions with probability density function $f(x)$,

- **Expected Value**
  
  $$\mu_X = E[X] = \int_{-\infty}^{\infty} x f(x) \, dx$$

- **Variance**
  
  $$\sigma_X^2 = V[X] = \int_{-\infty}^{\infty} (x - \mu_X)^2 f(x) \, dx$$

and the $(100p)^{th}$ percentile of $X$, denoted by $\eta$, is given by

$$\int_{-\infty}^{\eta} f(x) \, dx = p$$
2. Homework Covered

• Geometric distribution worksheet
• Calculus Practice Problems worksheet
• Chapter 3: 12-13, 16-18, 23-24, 29-30, 32-34, 39, 46, 49, 54
• Chapter 4: 1-6, 11, 12, 14, 19, 28-36, 41, 45, 59-62
• Chapter 5: 1, 3, 6, 22, 23
• Chapter 3: 68, 70-72, 78 [Extra Credit]
• Chapter 5: 47, 49, 51 [Extra Credit]

3. Definitions and Concepts

• Cumulative distribution function of a random variable
• Probability mass function of a discrete random variable
• Expected value and variance of discrete random variables
• Binomial distributions
  • For $|x| < 1$, $\sum_{n=0}^{\infty} x^n = \frac{1}{1-x}$
• Continuous random variable probability density functions
• Expected value and variance of continuous random variables
• Percentiles of a continuous random variable
• Uniform distributions
• Normal distributions
• $z_\alpha$ values
• Exponential distributions
• Joint distributions of discrete random variables
• Joint probability mass function tables and marginal probability mass functions
• Expected value of $h(X,Y)$ (discrete case)

4. Items that will not be on the exam

• Probability plots
• Jointly-distributed continuous distributions

5. Items that will be Extra Credit be on this exam

• Hypergeometric distributions
• Geometric distributions
• Central limit theorem

Enjoy your studies!