

Math 3215: Midterm 2 Topics

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1 Continuous Random Variables

- Density Functions
- Cumulative Distribution Functions
- Joint Distributions
- Marginal Distributions
- Calculating Expectations and Variances of Continuous Random Variables
- Uniform Distributions
- Normal Distributions
- Exponential Distributions

2 General Random Variables

- Covariance
- Basic Facts about Characteristic Functions $\phi_X(t) = \mathbb{E}e^{itX}$

3 Approximations

- Poisson Distribution and Approximation of Binomial
- approximating the birthday problem with a Poisson Distribution
- Normal Approximation of Binomial

4 Central Limit Theorem

- Precise statement of the Central Limit Theorem and its conditions
- Applying the CLT to estimate probabilities

5 Statistics

- Basic Statistical Method: Null hypothesis, alternate hypothesis, p -value, confidence level
- Parameter Estimation
- Maximum Likelihood Estimator
- Confidence Intervals for means
- Confidence intervals for differences of means
- Student's t -distribution
- one-sided confidence intervals

6 Acceptable Answers

- All answers should be given in closed form (i.e. not as a sum or product).
- It is perfectly ok to leave answers like $\Pr[Z \leq 2]$ or $\Pr[T_k > 1]$ where Z is a standard normal random variable and T_k is a t -distribution with $k - 1$ degrees of freedom.