# Math 461 Spring 2024

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# Outline

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Solution to HW9 is is on my homepage now.

Test 2 is this Friday. Today, I will do a brief review and then use the rest of the time to answer questions.

Materials covered on Test 2: Section 4.9, Section 5.1, Section 5.2, Section 5.3, Section 5.4, Section 5.5, Section 5.6, Section 5.7, Section 6.1, Section 6.2, Section 6.3, Section 6.4, Section 6.5, Section 6.6, Section 7.2, Section 7.4

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Section 5.1: Absolutely continuous random variables, density.

Density to distribution: integration

If $X$ is absolutely continuous, to go from distribution to density: differentiation.

Section 5.2: Expectation of absolutely continuous random variables

$X$ is an absolutely continuous random variable with density $f$ and $\phi$ is a function on $\mathbb{R}$. Find $E[\phi(X)]$.

Variance of an absolutely continuous random variable. Properties of expectation and variance

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Section 5.3: Uniform random variables. Expectation and variance.

Section 5.4: normal random variables. density, expectation and variance

Normal approximation to binomial (the DeMoivre-Laplace central limit theorem. rounding correctly when using normal to approximate integer-valued random variables.

Section 5.5: Exponential random variables: density, distribution, expectation, variance, memoryless property.

Section 5.6: Gamma random variables: density, expectation and variance.

exp is the continuous counterpart of geometric, Gamma is the continuous counterpart of negative binomial

Section 5.7: $X$ is an absolutely continuous random variable with density and $\phi$ is a function on $\mathbb{R}$. Find the density of $Y = \phi(X)$.

First find the distribution of $Y$, and then differentiate.

relation between normal and Gamma

Section 6.1: Joint distribution functions, marginal distribution functions.

Joint mass functions, marginal mass functions

Jointly abs. cont random variables, joint density, marginal density

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Section 6.2: Independent random variables. When finding probability involving two independent discrete random variable, try to break things up appropriately and then use independence

Section 6.3: Sums of independent random variables.

Sums of independent binomial random variables; Sums of independent Poisson random variables, Sums of independent negtaive binomial random variables; Sums of independent normal random variables, Sums of independent Gamma random variables.

Section 6.4: Conditional mass function

Section 6.5: Conditional density, find conditional probabilities

Section 6.6: the joint density of the min and max of $n$ iid abs cont random variables. The density of the min, the density of the max

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Sections 4.9 and 7.2: Expectation of sums of random variables

Section 7.4 covariance, correlation, properties of covariance, variance of sums of random variables

Basic facts about important random variables are summarized in two tables in Chap. 7 .

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