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Introduction Figure: Normal distribution • The density function of a random variable $X \sim N(\mu, \sigma^2)$ is: $f_X(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp(-\frac{(x-\mu)^2}{2\sigma^2})$ (To remember) Introduction Figure: Gamma distribution • The density function of a random variable X following a Gamma distribution of shape k and scale θ is: $f_X(x) = \frac{1}{\Gamma(k)\theta^k} x^{k-1} \exp(-x/\theta)$...

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Definition Stochastic calculus is a way to conduct regular calculus when there is a random element. Regular calculus is the study of how things change and the rate at which they change.

Description Think of stochastic calculus as the analysis of regular calculus + randomness.

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any linear combination of random variables following a multivariate normal distribution has a normal distribution. Let $[Z_1 \ Z_2]$ have a standard bivariate normal distribution. We have $B \in \mathbb{R}^{2 \times 2}$ $D = p \ s \ 0 \ p \ s \ t \ s \ Z \ 1 \ Z \ 2$ To see this, one can check that the right side has a centered bivariate normal distribution with covariance matrix $s \ s \ t \ .$ Thus, A must be the inverse of p

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The best result one can get is that if the integrand is deterministic, then the ensuing stochastic integral will be normal. This argument is made in two pieces: first imagine discretizing your deterministic integrand, so that it is a weighted sum of indicator functions. These indicator

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Basic facts: Definition of a Markov process Definition: Markov process Let $(X(t))_t$ be a stochastic process with natural filtration \mathcal{F}_t . X is a Markov process if the distribution of $X(t+s)$ conditional on \mathcal{F}_t is the same as the distribution of $X(t+s)$ conditional on $X(t)$, $\forall s > 0$.

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Following the method in this: Distribution of stochastic integral, I can show that each $I_t(f)$ is normally distributed for all t . To show that $I_t(f)$ is Gaussian, I need to show that for all $0 \leq t_1 < \dots < t_n$ and any $a_1, \dots, a_n \in \mathbb{R}$, $a_1 I_{t_1}(f) + \dots + a_n I_{t_n}(f)$ is Gaussian with mean 0.

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