

Monte Carlo Methods Spring 2025

Homework 05 - SDE

Due: Tuesday, Feb 25, 2024, 11:59 PM

1. (20 points) Suppose $X \sim N(\mu, \sigma^2)$ and $Y = e^X$.
 - Find the mean of Y . Use this to calculate the mean of the solution to the geometric Brownian motion $dX = \mu X dt + \sigma X dW_t$.
 - Find the pdf of Y .
2. (5 points) Explain why strong convergence always implies weak convergence i.e. argue that for pair of random variables X and Y ,

$$|\mathbb{E}[X] - \mathbb{E}[Y]| \leq \mathbb{E}|X - Y|.$$

Give an example of X and Y where this inequality is strict.

3. (25 points) Jupyter Notebook on Canvas.