

Unit 9 - Week 7

Course outline

How does an NPTEL online course work?

Week 0

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Kac's theorem on the stochastic representation of solution to a second-order linear ODE - Part 1

Kac's theorem on the stochastic representation of solution to a second-order linear ODE - Part 2

Geometric Brownian motion

A system of stochastic differential equations in application

Brownian bridge

Quiz : Assignment 7

Probabilistic Methods in PDE: Week 7 Feedback form

Week 8

Week 9

Week 10

Week 11

Week 12

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Assignment 7

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-03-18, 23:59 IST.

1) Let $z(x) := E(\int_0^\infty e^{-t/2} \sin(x + W_t) dt)$. Find the correct statements from below

3 points

- z solves $z''(x) = z(x) - 2 \sin(x)$
- z solves $z''(x) = z(x) - \sin(x)$
- z solves $\frac{z''(x)}{2} = z(x) - \sin(x)$
- z'' has countably infinitely many point of discontinuities
- z'' has only finitely many point of discontinuities
- z'' has no point of discontinuities

No, the answer is incorrect.
Score: 0

Accepted Answers:
 z solves $z''(x) = z(x) - 2 \sin(x)$
 z'' has no point of discontinuities

2) If the equation $dS_t = \mu S_t dt + \sigma S_t dW_t$, $S_0 = 1$ is satisfied by the process S , then

3 points

- $\ln S_t = \sigma W_t + \mu t$
- $\ln S_t = \sigma W_t + (\mu - \frac{\sigma^2}{2})t$
- $S_t = \exp(\sigma W_t + \mu t)$
- $S_t = \exp(\sigma W_t + (\mu + \frac{\sigma^2}{2})t)$
- $S_t = \exp(\sigma W_t + (\mu - \frac{\sigma^2}{2})t)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 $\ln S_t = \sigma W_t + (\mu - \frac{\sigma^2}{2})t$
 $S_t = \exp(\sigma W_t + (\mu - \frac{\sigma^2}{2})t)$

3) Let $(\Omega, \mathcal{F}, \{\mathcal{F}_t\}, P)$ be a filtered probability space and W denote the Brownian motion, adapted to it. If $X := \{X_t\}_{t \in [0,1]}$ satisfies, $dX_t = \frac{1-X_t}{1-t} dt + dW_t$ with $X_0 = 0$, then identify the correct statements

4 points

- X is called a Brownian bridge from 0 to 1
- X is called a Brownian bridge from 1 to 0
- $\max_{t \in [0,1]} X_t < \infty$ a.s
- $X_1 = 1$ a.s
- $X_t \geq 0$ for all $t \in [0, 1]$
- X is a martingale w.r.t. $\{\mathcal{F}_t\}$
- Y is a martingale w.r.t. $\{\mathcal{F}_t\}$, where $Y_t := X_t - t$, for $t < 1$
- Y is a martingale w.r.t. $\{\mathcal{F}_t\}$, where $Y_t := \frac{X_t - t}{1-t}$ for $t < 1$

No, the answer is incorrect.
Score: 0

Accepted Answers:
 X is called a Brownian bridge from 0 to 1
 $\max_{t \in [0,1]} X_t < \infty$ a.s
 $X_1 = 1$ a.s
 Y is a martingale w.r.t. $\{\mathcal{F}_t\}$, where $Y_t := \frac{X_t - t}{1-t}$ for $t < 1$