553.633/433

Pre-Exam Study Assignment/Homework #5

Due Monday 10/1/18

Two and a half problems:

2.23 (b) (Not necessary to do part (a) or code and implement the A-R solution)

A. Let $W(t)$ be the (standard) Wiener process. Find the variance of the quantity

$$V \equiv \sum_{j=0}^{N-1} \left(W(t_{j+1}) - W(t_j) \right)^2$$

in terms of δt ($\delta t = t_{j+1} - t_j$ for all j). (The quantity above is mentioned near the middle of p. 531 in Higham, 2001; you are to work out the exact variance, not just the "big-O" value, as in Higham.)

B. Provide a *one-paragraph* discussion as to why the Euler–Maruyama form in eq. (4.3) of Higham (2001) "makes sense." That, is comment on why (4.3) is a natural discrete representation of the SDE in (4.1) and (4.2) of Higham and how you would implement (4.3) in a Monte Carlo simulation. (In the next HW assignment, you will be doing an actual numerical experiment related to (4.3)). You should use proper grammar and logic in constructing this paragraph, but you are not expected to provide a formal mathematical proof of any claims that you make. You may pretend that you are writing to company manager with an M.S. degree in some technical area involving probability and stochastic processes, but who is *not* familiar with the details of SDEs. The paragraph must be typed (i.e., no handwritten submissions allowed)