Spring 2009, Math 5050-1
Assignment 5

1. Choose and fix an integer $n > 0$. And recall that the simple random walk of time step size $1/n$ and space step size $1/\sqrt{n}$ is approximately Brownian motion from time 0 to time t [after linear interpolation of the path of the walk from time 0 to time nt]. Use this to simulate a Brownian motion from time 0 to time 1, using:

(a) $n = 100$;

(b) $n = 200$;

(c) $n = 500$.

In every case, plot the graph of $(s\,, X_s)$ as a function of time $s \in [0\,, t]$.

2. Run 10,000 simulations of Brownian motion, using $n = 500$ [from time zero to time one]. Use this to estimate the probability that Brownian motion hits 0.001 before -0.003. Discuss if, and how well, your simulation estimate agrees with exact formulas.