Subject: Computational Physics

Lab sheet - 9

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1. Generate 10^4 random numbers between [0:1] and plot the probability distribution of these numbers in the said range.

2. Generate 5×10^4 Gaussian random numbers and plot the probability distribution of these numbers in the range $[-5 : 5]$. Note that in principle the range should be $[-\infty : \infty]$!!

3. A Brownian particle of negligible mass is diffusing freely in a fluid medium (two dimensions). It obeys the following equation

$$\frac{d\vec{r}(x,y)}{dt} = \sqrt{D_0}\,\vec{\xi}(t)\,,$$

where $\vec{\xi}(t)$ is the random force arising due to the collision of fluid molecules and the Brownian particle, and D_0 is the diffusion constant which can be set to 1.

Using Euler's method, generate the trajectory of the particle in a finite time window and plot it. For your information, $r_x(t + \Delta t) = r_x(t) + \sqrt{D_0 \times \Delta t}\; G_x$, where G_x is a Gaussian random number. Follow the same step for the $y-$ component r_y.