MATLAB/Excel

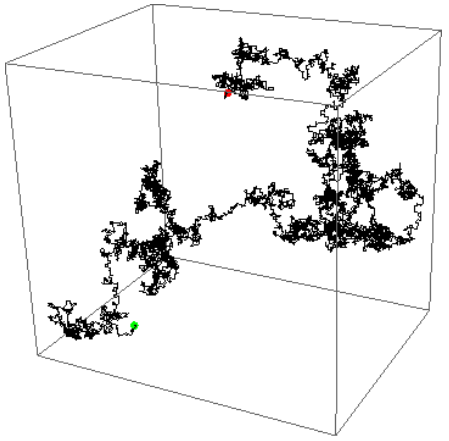
- Example 1: random walks
  - random number generators
  - Excel: COUNTIF, VLOOKUP
  - MATLAB: for loops, if statements, plotting
- Example 2: naïve Monte Carlo integration
  - MATLAB: for loops, if statements, plotting

Example 1: random walks

- Diffusion: molecules undergoing random walks
- Molecule takes *n* steps of size *l*, each in a random direction, over a time interval *t*
- What is the probability density, *p(x,t)*, of observing a molecule between *x* and *x* + *dx* after time *t*?
- **Answer** (1-D case, limit of large *n*):

$$p(x,t) = \frac{1}{\sqrt{4\pi Dt}} \exp\left(-\frac{x^2}{4Dt}\right)$$

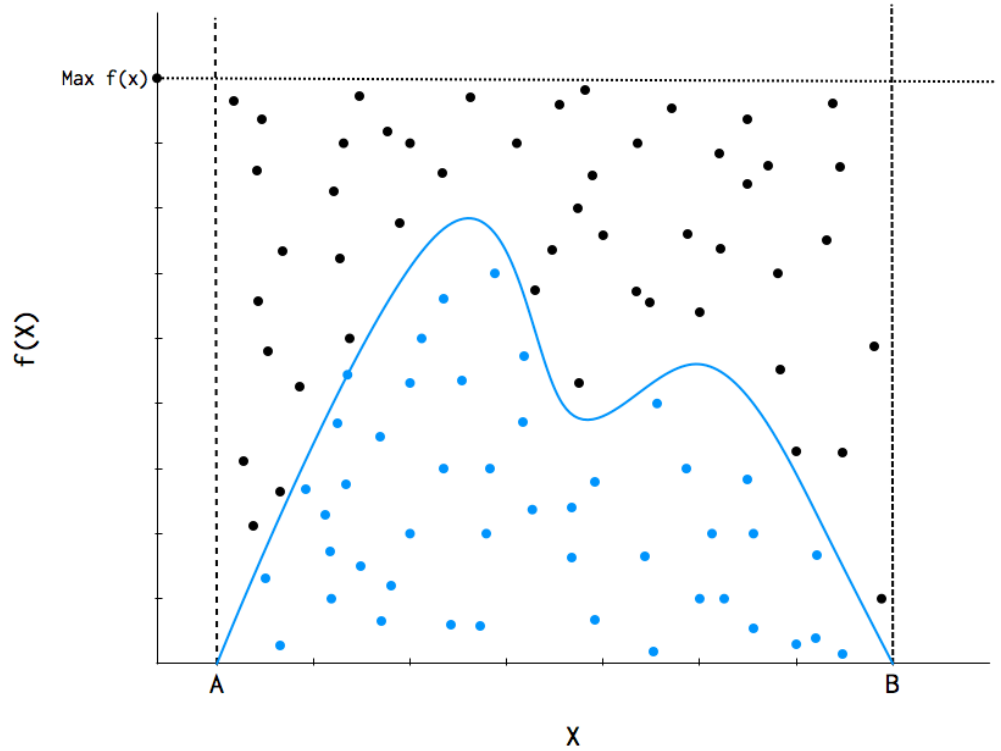
$$D = \frac{nl^2}{2t}$$



- **Objective**: verify this through simulation of 1-D random walks

Example 2: naïve Monte Carlo integration

- Find the area under the curve by generating random points



Useful MATLAB functions

- General: changing figure properties
  - Get figure handle H, e.g. `H = plot(x,y)`
  - `set(H,'PropertyName',PropertyValue,...)`

- Updating displayed data
  - `set(H, 'XDataSource', variable_containing_xdata)`
  - `set(H, 'YDataSource', variable_containing_ydata)`
  - `Refreshdata`

- `help name_of_function`