University of Aberdeen, Department of Computing Science

CS1028 Practical 6

Programming for Sciences and Engineering

25 October, 2019

1. Create a plot, similar to the one on the last slide of Lecture 12, that shows the graph of the sine, the cosine, and the tangent function. Take the x-range as $[-2\pi, 2\pi]$.

   Proceed in the following steps:

   a) Create a fine grid of (100 or more) x-values covering the x-range (as a list or a one-dimensional numpy array if you prefer).

   b) For each of the three functions, create a corresponding list of y-values.

   c) Plot all three in one figure.

   A couple of things to note:

   - You do not need numpy for the exercise (you can of course use it). However, you do need matplotlib for plotting.
   - The poles of the tangent function are a little challenge: you need to specify the y-range in order to get a sensible plot.

2. Two-dimensional random walk

   a) Take $n = 10\,000$ and create a sequence of random numbers $x_1, \ldots, x_n$ drawn from the standard normal distribution (hint: `random.gauss(0,1)`) and store them in a list (or a one-dimensional numpy array if you prefer). Then create the sequence $s_1, \ldots, s_n$ of cumulative sums, i.e.,

   $$s_k = x_1 + x_2 + \ldots + x_k$$

   for any k from 1 to n.

b) Store $s_1, \ldots, s_n$ in a text file called `s-values.txt`.

c) Redo the whole thing, creating standard normal variates $y_1, \ldots, y_n$, corresponding cumulative sums $t_1, \ldots, t_k$ and store them in a text file called `t-values.txt`.

d) Make a plot of the n points $(s_1, t_1), \ldots, (s_n, t_n)$, where two successive points are joint be a line.