Stat/Chem3240: Homework 3a
Matlab

September 15, 2015

1. Write the code for the function template makeVec(n) that takes a positive integer n as input and then generates a length-10 vector `f` as output according to the following formula:

$$f_k = \begin{cases} n & \text{if } k = 1 \\ 3f_{k-1} + 1 & \text{if } 10 \geq k > 1 \text{ and } f_{k-1} \text{ is odd} \\ f_{k-1}/2 & \text{if } 10 \geq k > 1 \text{ and } f_{k-1} \text{ is even} \end{cases}$$

   Remember to preallocate the vector before assigning values to it in a loop. Upload your completed function to Cody as well as to the collab site, along with the test suite.

   Remember to comment your code as described in assignment 1.

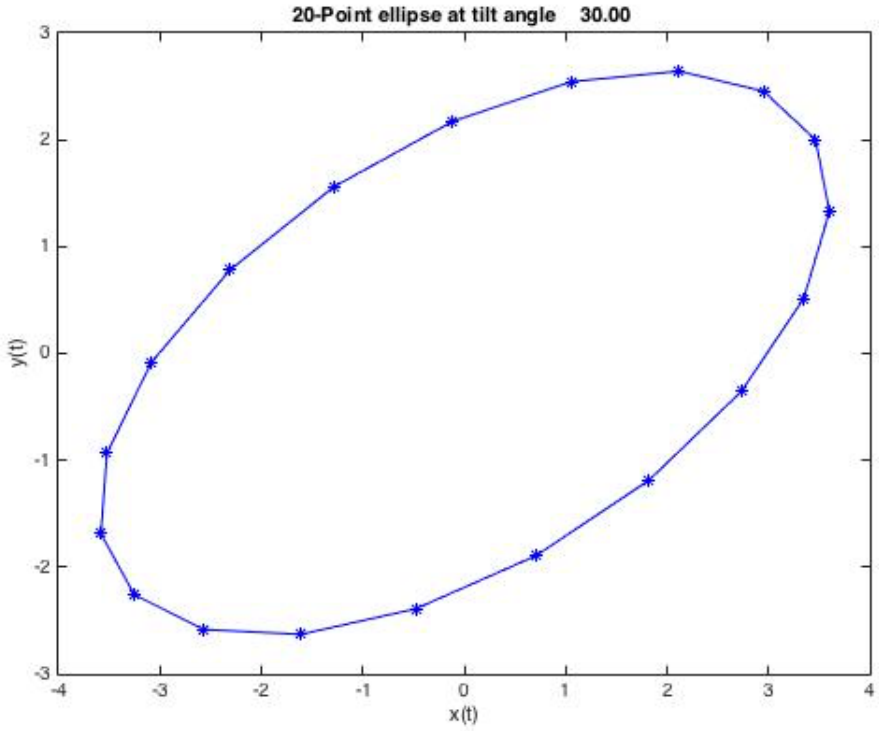
2. Write the code in the function template makeEllipse(theta,n) that generates and plots the (x, y) coordinates for an ellipse specified by the parametric equations

$$\begin{aligned} x(t) &= a\cos(t)\cos(\theta) - b\sin(t)\sin(\theta) \\ y(t) &= b\sin(t)\cos(\theta) + a\cos(t)\sin(\theta) \end{aligned}$$

   where $0 \leq t \leq 2\pi$ and θ is the tilt angle in radians, and n is the number of points to draw the ellipse (i.e. the n values of t spanning the interval $[0, 2\pi]$. Let $a = 4, b = 2$, and assume θ is constrained to

be an angle in degrees in the interval $[-360, 360]$, and the input n is such that $3 \leq n \leq 500$. Remember to convert from degrees to radians. Use array-based operations to generate the x and y arrays for the plot. Create a plot for $\theta = 30, n = 20$ with the x-axis labeled '$x(t)$', the y-axis labeled '$y(t)$', and the title 'n-Point Ellipse with Tilt Angle theta', where n and theta are replaced by their actual values. Use the `sprintf` command as the argument to the `title` command to accomplish this. The output of the function makeEllipse will be the x and y coordinate vectors. The code should programmatically save the plot as a pdf file (see saveas command) named myEllipse.

The following figure is what the output plot should look like, including points markers and connecting lines (see plot options).



Upload your completed function to Cody as well as to the collar site, along with the test suite and a saved pdf file of your plotted ellipse.