Phys234, 2018, Problem set #4: Due Monday March 5, 8pm

Question 1, 2:

Questions 1 & 2 will be given at the start of the lab.

Question 3:

The equation $x\ \tan(x) = c$, where c is a parameter, has two roots in the range $0 \leq x \leq 2\pi$. Write a function `ps4q3` that produces a plot of the variations of the two roots as a function of c in the range $0.1 \leq c \leq 10$. Your plot should have values of c on the x-axis and the values of the roots on the y-axis. You can use your method of choice to find the roots. Don't forget to includes axis labels and a legend on your figure. (*Hint:* The easiest way to solve this problem is to use `fzero`. Use Matlab help to figure out how to use `fzero` for multiple input parameters)

Question 4:

Use Matlab's built-in \ operator to solve the following system of equations. Write your answer in a function `ps4q4.m` that produces the appropriate A and b, and prints out the solution vector.

$$\begin{aligned} x_1 + 2x_2 - x_4 &= 9 \\ 2x_1 + 3x_2 - x_3 &= 9 \\ 4x_2 + 2x_3 - 5x_4 &= 26 \\ 5x_1 + 5x_2 + 2x_3 - 4x_4 &= 32 \end{aligned}$$

Question 5:

Write a `parabola` function to automatically set up and solve the system of equations for a parabola defined by $y = c_1x^2 + c_2x + c_3$. The function definition should be

```
function c = parabola(x,y)
```

The function `parabola` should take two input vectors x and y, each of length 3, that define three points through which the parabola passes. The function should return a vector of the three coefficients c_i. To test your function `parabola`, write a function `ps4q5.m` that finds the coefficients c_i for the following set of (x_i, y_i) data points: $(-2,-2), (-1,1), (2,-1)$. Then, use the obtained set of c_i to create 100 points for $-3 \leq x \leq 3$ that match the equation of the parabola, and plot these points (as a solid line) along with the original three data points (plotted as circles) to verify that the equation of the parabola has been obtained correctly. Include axis labels and a legend on your plot.