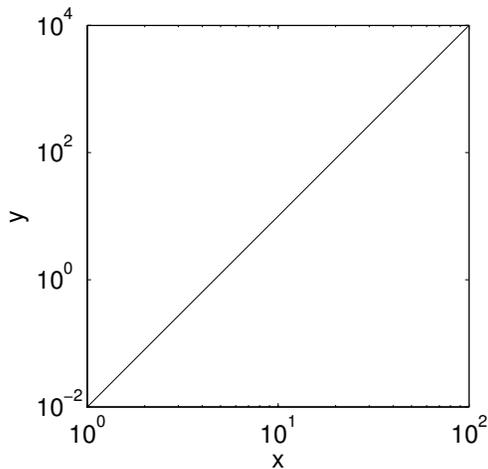


Problem 1. Write Matlab code for plotting $y = 1.2e^{-0.8x}$ as a red line, for 100 evenly spaced points in x between -10 and 10 . Choose a plotting function that highlights the functional relationship between y and x . Label the axes and title the graph.

Problem 2. Write an equation for y as a function of x for the following data plot.



Problem 3. Write Matlab code that produces a contour plot of $(1 - y^2) \sin x$ over the rectangle $-1 \leq y \leq 1$ and $-\pi \leq x \leq \pi$, with 30 evenly spaced points in each of x and y .

Problem 4. Write Matlab code that produces the solution of the following system of equations

$$\begin{aligned}w - x + z &= 2 \\2x + 3y - 4z &= -5 \\4w - 3x + 2y + z &= 3 \\-w + 3x + 6y &= 11\end{aligned}$$

Problem 5. Write one line of Matlab code that would verify that the solution computed in the previous problem satisfies the given equations. Hint: you can answer this in as little as five characters, or perhaps even three.

Problem 6. Write a Matlab function that returns a numerical approximation to e using the following series, where N is an input argument to the function. (Bonus: if floating point precision is approximately 10^{-16} , at what value of N does the sum stop changing?)

$$e \approx \sum_{n=0}^N \frac{1}{n!}$$

Problem 7. The Lorenz system is a ordinary differential equation in three variables $[x, y, z]$ defined by

$$\frac{dx}{dt} = s(y - x), \quad \frac{dy}{dt} = x(r - z) - y, \quad \frac{dz}{dt} = xy - bz$$

Write Matlab code for an anonymous function that returns the vector $d\mathbf{v}/dt = [dx/dt, dy/dt, dz/dt]$ given an input vector $\mathbf{v} = [x, y, z]$, using parameter values $s = 10$, $b = 8/3$, and $r = 28$.

Problem 8. Revise your answer to Problem 7 so that the anonymous function is in the right form to be passed into Matlab's `ode45` function, and write Matlab code that would integrate the Lorenz system from $t = 0$ to $t = 100$, from the initial condition $x = 0$, $y = 1$, $z = 0$.

Problem 9. Suppose you have a biased coin that has a 53.8% chance of landing “heads” on any given toss, and you want to figure out how likely it is that, out of ten coin tosses, you’ll get exactly n heads, for each value of n between 0 and 10. Write a Matlab function that would estimate the probability getting n heads in ten tosses.

Problem 10. Write Matlab code that would set C to a matrix representing the connectivity of the following network of links.

