General Sir John Kotelawala Defence University
Faculty of Engineering
Department of Mathematics
Mathematical Software - MA 1232

Learning Outcomes Covered: LO2
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Intake 39 - Semester 2 | Tutorial 03 | 15.08.2022

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1. Plot the following functions in MATLAB.
   (a) $y = 3\ cos\ 2x$ for $0 \leq x \leq 7$. (increment = 0.01)
   (b) $y = x^3 + 13x^2 + 52x + 6$ over the range $-7 \leq x \leq 1$.
   (c) $x = 10e^{-0.5t}\ sin(3t + 2)$ for $-1 \leq t \leq 1$.
   (d) $y = x + 2e^{-x} - 3$ for $0 \leq x \leq 2$.

2. The following equation used to describe the blood pressure in the aorta during systole (the period following the closure of the heart's aortic valve). The variable t represents time in seconds, and the dimensionless variable y represents the pressure difference across the aortic valve, normalized by a constant reference pressure.

$$y(t) = e^{-8t}\ sin\left(9.7t + \frac{\pi}{2}\right)$$

   Plot the above function for $0 \leq t \leq 0.5$.
   Use an increment of 0.003 to produce a smooth curve.

3. The current i passing through an electrical resistor having a voltage across it is given by Ohm's law,$i = v/R$ where R is the resistance. The power dissipated in the resistor is given by v^2/R. The following table gives data for the resistance and voltage for five resistors.

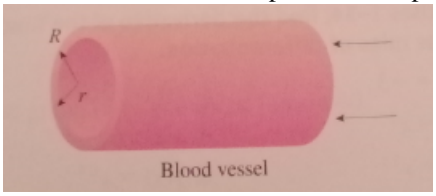
	1	2	3	4	5
R(ohms)	10^4	2×10^4	3.5×10^4	10^5	2×10^5
v(V)	120	80	110	200	350

   Use the data to compute
   (a) The current in each resistor.
   (b) The power dissipated in each resistor.
   Plot the graphs for the variation of current and power against resistance in the same plot.

4. The velocity (in centimeters/second) of blood, r cm from the central axis of artery is given by

$$v(r) = k(R^2 - r^2)$$

   where k is a constant and R is the radius of the artery (see the accompanying figure) Suppose $k = 1000$ and $R = 0.2$cm. Write a script file to compute v for the range of values of $r = 0.1 : 10$. Plot the graph of v against r.



5. A study of the records of 85,000 apartment units in the greater Boston area revealed the following data.

Year (t)	2002	2003	2004	2005	2006
Occupancy Rate, % (r)	95.6	94.7	95.2	92.1	96.1

   Find the average occupancy rate for 5 years and plot the graph t vs r.

6. . $y = cos\ x$
   $y = 1 - \frac{x^2}{2} + \frac{x^4}{24}$
   Using the above two equations create a figure containing three subplots by following below guidelines.

(a) Create first subplot using first equation

(b) Create second subplot using second equation

(c) Create third subplot using both equations

Create two subplots across the upper half of the figure and a third subplot that spans the lower half of the figure. Add titles to each subplot and use the range $-3.8 \leq x \leq 3.8$.

7. The following equations generate a three-dimensional curve as the parameter t is varied over some range:

$$x = e^{0.05t} sin\ t$$

$$y = e^{0.05t} cos\ t$$

$$z = t$$

Let t vary from $t = 0$ to 10. Plot the graphs for the above equations.

8. Create a mesh plot, a surface plot and a contour plot of the function,

$$z = xe^{-[(x-y^2)^2+y^2]}.$$

for $-2 \leq x \leq 2$ and $-2 \leq y \leq 2$, with a spacing of 0.1.