Exercises for Day 21

Exercise 1. When a mass-spring-damper system is displaced from its static equilibrium position and released from rest, the system's oscillatory response $x(t)$ over time t is governed by an expression of the form

$$x(t) = x_0 e^{-at} \cos \omega t \, ,$$

where x_0 is the initial displacement, a is the rate of decay of the response, and ω is the frequency of oscillation. Let $x_0 = 3$ cm, $a = 0.2$ 1/s, and $\omega = 4$ rad/s. Use "`:`" to create a time vector starting at 0 s and going to 6 s in steps of 0.01 s, and then compute the system's displacement $x(t)$ over this time range using the "`.`" operator. Plot the displacement as a function of time. Be sure to include good axis labels and a title.

Exercise 2. Consider the function

$$y(x) = \frac{1}{x} + (\sin(x))^2 \, .$$

Using the "`:`" operator, create a vector of x values ranging from 1 to 9 in steps of 0.4. Next, use the "`.`" operator to evaluate the function $y(x)$ at every specified x value. Lastly, print your results to a text file as a two-column table. Your table should begin as follows:

```
    x          y(x)
-------    --------
  1.0        1.708
  1.4        1.685
  1.8        1.504
  2.2        1.108
```

Use a single `fprintf` command to print the values stored in your vectors. (You may use additional `fprintf` commands to print the table header.)