SGN-84007 Introduction to Matlab

Exercise Set 6: October 4–7, 2016

Exercises/pages refer to Hahn&Valentine: Essential Matlab for Engineers and Scientists (5th Edition)

1. Let us look into the symbolic math features of Matlab.
   a) Define a symbolic variable `x` as follows

      ```
      x = sym('x');
      ```

      This creates a variable with name 'x' and stores that into matlab variable `x`.
   b) Now we can compute symbolical expressions with `x`. Compute the indefinite integral of $f(x) = x$ by:

      ```
      int(x)
      ```

   c) Compute the indefinite integral of function $f(x) = \log(x)^2$.
   d) Compute the derivative of function $f(x) = \cos(x^2)e^{-x}$. (See `help diff`).
   e) Compute the second derivative of function $f(x) = \cos(x^2)e^{-x}$.

2. a) Evaluate the integral $\int_0^1 \sqrt{x}\, dx$ using the symbolic variable `x` defined in task 1.
   b) For comparison, compute the same thing numerically:
      - Define the function $f(w) = \sqrt{w}$ as shown in slide 25 of slide set 2. We use w as our variable because x is now symbolic.
      - Use matlab command `integral` to compute the integral $\int_0^1 \sqrt{x}\, dx$

3. Solve the following system of equations

$$\begin{aligned} 2x - y + z &= 4 \\ x + y + z &= 3 \\ 3x - y - z &= 1 \end{aligned}$$

   with three symbolic variables and using `solve`.

4. Exercise 6.1 on page 159. Let A be the 3×3 matrix. Calculate `A*A`, `A.*A`, `A/A`, and `A./A`. Explain.

5. a) Estimate the value π as described in Exercise 8.2 (a) on page 191 using a for loop.
   b) Do the same thing without using a for loop.