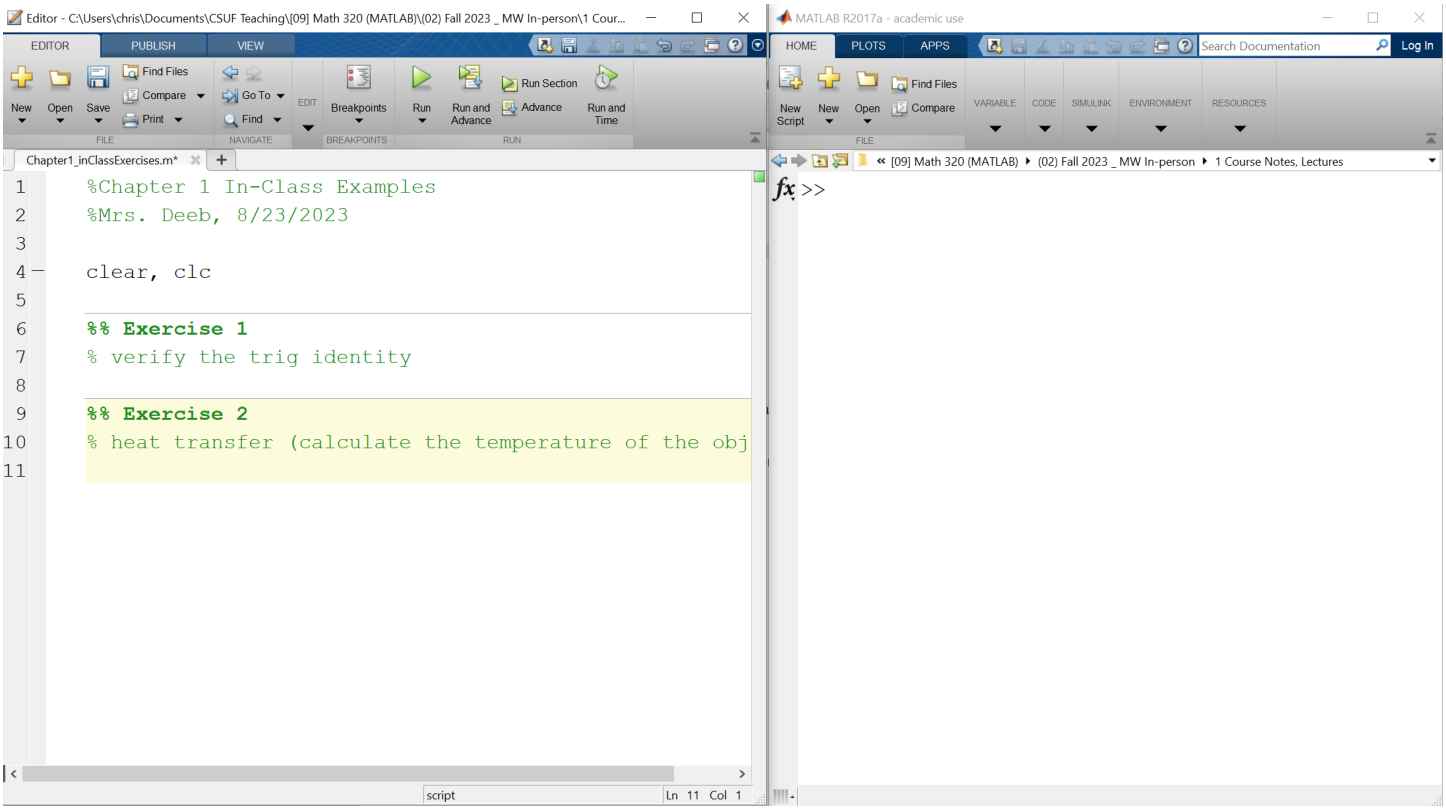
Mrs. Christine Deeb

Chapter 1: Starting with MATLAB

In groups of 3 – 4 people, complete the following problems in a script file **using the methods we have learned in class up to this point. This means all exercises can be completed using Chapter 1 material.**

You will ***not*** need to submit the script file for grading. Remember that you can use a double percent (%%) to create sections in your file!

It is good practice to start your script file with a small explanation/title of what your file does. For example:



Chapter 1 Exercises

Exercise 1: Write a program that gives the roots of the quadratic $y = 3x^2 + 2x - 2$.

Exercise 2: Write a program that gives the coordinates of the vertex of the parabola $y = 3x^2 + 2x + 1$.

Exercise 3: This is Sample Problem 1-1 on page 24 of the textbook.

A trigonometric identity is given by:

$$\cos^2 \frac{x}{2} = \frac{\tan x + \sin x}{2 \tan x}$$

Verify that the identity is correct by calculating each side of the equation, using $x = \frac{\pi}{5}$.

Exercise 4: This is Sample Problem 1-3 on page 26 of the textbook.

An object with an initial temperature of T_0 that is placed at time $t = 0$ inside a chamber that has a constant temperature of T_s will experience a temperature change according to the equation:

$$T = T_s + (T_0 - T_s)e^{-kt}$$

where T is the temperature of the object at time t, and k is a constant. A soda can at a temperature of $120°\text{F}$ (after being left in the car) is placed inside a refrigerator where the temperature is $38°\text{F}$. Determine to the nearest degree, the temperature of the can after three hours. Assume $k = 0.45$. First define all the variables, then calculate the temperature using one MATLAB command.

Exercise 5: This is Sample Problem 1-4 on page 26 of the textbook.

The balance B of a savings account after t years when a principal P is invested at an annual interest rate r and the interest is compounded n times a year is given by:

$$B = P\left(1 + \frac{r}{n}\right)^{nt}$$

Suppose \$5000 is invested for 17 years in one account (we'll call this Account #1) for which the interest is compounded yearly. In addition, \$5000 is invested in a second account (we'll call this Account #2) in which the interest is compounded monthly. In both accounts, the interest rate is 8.5%. Use MATLAB to determine how long (in years and months) it would take for the balance in the second account to be the same as the balance of the first account after 17 years.

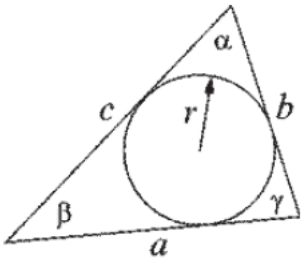
Steps to take:

1. First calculate B for Account #1.
2. Using the details for Account #2 along with B from step 1., solve for t.
   - You will have to get an expression for t by-hand, then use MATLAB as a calculator.
3. Determine the number of years and months that correspond to t.

- You will need to use some of the built-in rounding functions from 1.5!

Exercise 6: This is problem 19 on page 30 of the textbook.

For the triangle shown, $\alpha = 72°$, $\beta = 43°$, and its perimeter is $p = 114$ mm. Define α, β, and p as variables and then:



a) Calculate the triangle sides (using the law of sines). ***This is not very obvious!***

b) Calculate the radius r of the circle inscribed in the triangle using the formula:

$$r = \sqrt{\frac{(s-a)(s-b)(s-c)}{s}}$$

where $s = \frac{a+b+c}{2}$.

Note: In a triangle where side a is opposite angle α, side b is opposite angle β, and side c is opposite angle γ

The law of sines is

$$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c} \text{ or } \frac{a}{\sin\alpha} = \frac{b}{\sin\beta} = \frac{c}{\sin\gamma}$$

The law of cosines is

$$a^2 = b^2 + c^2 - 2bc\cos\alpha \quad ; \quad b^2 = a^2 + c^2 - 2ac\cos\beta \quad ; \quad c^2 = a^2 + b^2 - 2ab\cos\gamma$$