Exercises for Day 11

Exercise 1. Write a script that loops from 1 to 10, and prints out different messages depending on the value of the loop variable. The messages should look like the following:

```
 1 is less than or equal to 2
 2 is less than or equal to 2
 3 is bigger than 2 and less than 4
 4 is greater than or equal to 4, and less than 7
 5 is greater than or equal to 4, and less than 7
 6 is greater than or equal to 4, and less than 7
 7 is greater than or equal to 7
 8 is greater than or equal to 7
 9 is greater than or equal to 7
10 is greater than or equal to 7
```

Use a single `if` block within the loop to accomplish this task. (You can use as many `elseif` statements as you like.)

Exercise 2. For Day 2 Exercise 2, you computed the roots, x_1 and x_2, of the quadratic equation

$$ax^2 + bx + c = 0$$

for specified values of the coefficients a, b, and c using the quadratic formula:

$$x_1 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \quad , \qquad x_2 = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

Recall that, depending on the (real) values of a, b, and c, there are three possible types of solutions for the roots when using the quadratic formula:

1. if the discriminant $b^2 - 4ac > 0$, then x_1 and x_2 are real and distinct
2. if the discriminant $b^2 - 4ac < 0$, then x_1 and x_2 are complex conjugates
3. if the discriminant $b^2 - 4ac = 0$, then x_1 and x_2 are real and repeated

Write a program that does the following:

- Asks the user to input the values for a, b, and c
- Returns the type of roots and their values to the Command Window
- Prints to a text file the input values using the format XX.XX
- Prints to a text file the corresponding calculation results

Note: When the roots are complex, you must separately print the real and imaginary parts when using `fprintf`. To extract the real part of a complex number, use the `real` command. Likewise, `imag` extracts the imaginary part. For example, if `x = -1 - 2*i`, then `real(x)` returns `-1` and `imag(x)` returns `-2`.

(over)

When printing the types of roots and their values, use the format specified in the following table:

Case	Output

$b^2 - 4ac > 0$	`The roots are real and distinct:`
	`x1 = XX.XX`
	`x2 = XX.XX`

$b^2 - 4ac < 0$	`The roots are complex conjugates:`
	`x1 = XX.XX + (XX.XX)i`
	`x2 = XX.XX + (XX.XX)i`

$b^2 - 4ac = 0$	`The roots are real and repeated:`
	`x1 = XX.XX`
	`x2 = XX.XX`

Run the following three cases:

1. $a = 1$, $b = 7$, and $c = 11$
2. $a = 1$, $b = 6$, and $c = 9$
3. $a = 1$, $b = 5$, and $c = 7$

When printing the inputs and outputs to your text file, instruct MATLAB to *append* the three cases to the file. You can do this in the `fopen` command by using `'a'` instead of `'w'`:

```
f_no = fopen('Day11_Ex2.txt', 'a');
```

If you mess up the text file, simply delete it from your directory and re-run your script to create a new one. Turn in a copy of your final text file with all three cases and your program's code.

Exercise 3. We want to combine two mathematical functions $f(x)$ and $g(x)$ to make a new function $h(x)$. At any given x value, $h(x)$ is equal to the smaller of the two functions.

- Write a script to plot $f(x)$ and $g(x)$ given below for x from -10 to 10. Use a sufficiently fine increment to give smooth curves.

$$f(x) = \frac{x+7}{x^2+8} \qquad g(x) = \frac{4x}{x^2-200}$$

- Now add a third curve for $h(x)$. Recall that, at any given x value, $h(x)$ is equal to the smaller of the two functions. That is, if $f(x) > g(x)$, then $h(x) = g(x)$. Otherwise, $h(x) = f(x)$. You should be able to tell if $h(x)$ is correct by looking at the plot, since it is the smaller of the two functions you already plotted.
- Use good line types for the curves so you can tell them apart in a black-and-white printout, and add a legend.
- Give your plot good axis labels and a title.
- Turn in the plot and the script.