Exercises for Day 23

Exercise 1. Complete and turn in the chessboard exercise described in the class lecture today. Print out your figure, your top-level program, and your function(s).

Exercise 2. Find your code from Day 11 Exercise 2 that you wrote to compute the roots of a quadratic equation. Modify this program so that the roots of the quadratic are calculated within a function called `find_roots`. Inputs to the function should be the coefficients a, b, and c (i.e., $ax^2 + bx + c = 0$). Outputs from the function should be x_1 and x_2 (the roots of the equation), so that the calling statement looks like

```
[x1,x2] = find_roots(a,b,c)
```

Within your main code, call the function to solve for the roots of the following quadratics:

Equation 1: $10x^2 + 20x + 30 = 0$

Equation 2: $x^2 + 4x + 2 = 0$

Print the answers to a text file using the following format:

```
The roots of Equation 1 are x1 = X.XX + (X.XX)i and x2 = X.XX + (X.XX)i.

The roots of Equation 2 are x1 = X.XX + (X.XX)i and x2 = X.XX + (X.XX)i.
```

Turn in the text file and the code for your main program and function.

Exercise 3. Get out the latest version of your trajectory program from Day 12 Exercise 4. Modify the program so that the position calculation is made in a function called `find_position`. Inputs to the function should be V_{launch} (launch speed in m/s, a scalar), θ_{launch} (launch angle in degrees, a scalar), and t (flight time in seconds, a scalar). Outputs from the function should be x_{pos} (horizontal distance in meters measured from the origin, a scalar) and y_{pos} (vertical distance in meters measured from the origin, a scalar) so that the calling statement looks like

```
[x_pos,y_pos] = find_position(V_launch,theta,t)
```

Your main code is responsible for

- determining the flight time (in seconds) corresponding to the maximum altitude of the trajectory and printing the result to a text file;
- plotting the two-dimensional trajectory up to the maximum altitude.

Use $V_{\text{launch}} = 80$ m/s, $\theta_{\text{launch}} = 50^\circ$, and a time step Δt = 0.1 second in your calculations.

Turn in the text file, the plot, and the code for your main program and function.