**UCF Physics PHZ 3150: Introduction to Numerical Computing**
**Fall 2021 Homework 5**
**Due September 23 2021**

Goals: Become familiar with Python, modules, lists and tuples.
Reading and study: Read Think Python Chapters 10 and 12.

Problems to Hand In: For this assignment, your log is part of your homework. In one of the entries, it should identify the start and end of HW5 and list the problem numbers in order. Keep notes about what you are doing for each exercise/problem, as well as the answers to the problems. If you made a HW5 entry in your log in a prior session and want to change it, just copy it to the current (last) session, and edit there. We will grade the last entry only. All text related to one assignment should be in one entry, with the problems done in order.

Problem 1 (**5 points**). Make a new folder named `hw5_<yourname>` under you `handin` folder. For this homework your main homework file is a Python file named `hw5_<username>.ipynb`. Save it in your homework folder. Remember to commit your files and push to GitHub (also, great backup!). Your name, assignment number, and the date should appear as comments at the top of the notebook. At the start of every problem write the problem number using markdown comments. Any remarks or written answers you may make should also be written with markdown. If you need to comment something in the code (for coding clarity) do so with a normal comment (i.e., `# this is a comment`). **Print the problem number (as in "Problem 1:") before each problem's output.** Use the print() function to print, don't just type the expression. Start your notebook by importing numpy.

Problem 2 (**15 points**). Create a list `velocity` with numbers starting from 0 to 100 with a step of 10. Create a list `time` with numbers from 0 to 1000 with a step of 100. Print it. Print the 3rd to 5th and the 8th `velocity` element. Import the `acceleration` function you created for the previous homework. Call the function and calculate the `acceleration` of a target for each of these `velocity` pairs (so the 3rd-4th, 4th-5th, 5th-8th element), using the corresponding times. Remember that Python starts counting from 0! Change the 5th element of `velocity` to 40 and print `velocity`.

Problem 3 (**10 points**). Create a numpy array `x` that goes from 1 up to and including 100 (last element *must* be 100.0) with a step of 0.1. Verify its type using the type command and its size using the shape command. Print `x`. Print its maximum, minimum and mean. Subtract 52 from `x` and print it. Print an array whose values are 5% of the elements of `x`.

Problem 4 (**10 points**). Create a list `student_h` that contains the heights of students in feet and inches. A person being 5' 6" would be noted as 5.06, a person being 5' 10" would be noted as 5.10. Populate it with the following values: 5.01, 4.10, 6.02, 5.07, 6.11. Create a function `ft_to_m_cm` that takes as input a value from `student_h` and returns each height in a list [m, cm] (round cm up). Call the function for all values of `student_h` and print the results with an informative sentence (e.g., Student 1 has a height of 1 m 10 cm ) (Remember that 1 ft ~= 0.3048 m and 1 inch ~= 0.0254 m and 1m has 100cm).

Problem 5 (**20 points**). Create a function `displacement(u_init, t ,a)` that calculates the total displacement of a body during a time interval `t`, when the body has initial speed `u_init` and a constant acceleration `a`. Save it in a separate .py file, not your main homework file. Remember to start the function with a proper docstring. Also, remember that the displacement of a body that moves with a constant acceleration is given by `s=u_init*t+0.5*a*t2`, where `t` is the total time the object moves, `a` the constant acceleration and `u_init` the initial speed of the body. In your main homework file import the function and calculate the total displacement for `u_init=0`, `a=[10, 20, 30]` and `t=[2,4,14]`. Again, calculate these numbers some other way to check that they are correct, and write on your log how you checked it.

Problem 6 (**10 points**). Prepare and submit your homework. Copy the finalized Jupyter notebook to the `handin/hw5_*` folder and don't forget to commit and push it to GitHub. Explain what you did to do that in your log. Make a screenshot that shows you committed the file and add it to your `handin/hw5_*` folder (remember to use an appropriate name for the screenshot!). Write what you did to make and submit the zip file into your log. When satisfied, close the log, copy it to your homework directory one last time, and run the commands to make and submit the zip file. Turn the file in on WebCourses.