I do not assume in this class that you have any experience programming in python. In this class you are expected to use web searches to find out how to accomplish your goals. If you run into difficulty when doing so, then you should ask for help.

# 1 Pair programming

In this course, you will be doing pair programming, which means you will be working in pairs at a single computer. One member of the pair will have the keyboard and will be the driver while the other is the navigator. The role of the navigator is to watch for mistakes, think ahead, give advice, and plan strategically. I will periodically ask you to switch roles. From time to time, your pairs will also be switched up, possibly in the middle of a project, so you need to be careful to always understand how your program works, and to write it in such a way as it will be easily understood by a new partner!

# 2 *Not* bringing your code

**You should *not* bring any of your own code into class.** You may not make use of code that you have previously written outside of class *or* code that you previous wrote during class, unless that code is on the class laptop that you are using. Bringing in your own code puts your partner at a disadvantage, and also undermines the course goal of giving you practice writing code.

# 3 Getting started with python

We will be using the jupyter notebook to edit and run python programs. You can start jupyter notebook by pressing the windows key (or moving the mouse to the upper-left corner of the screen) and then selecting ”anaconda” and ?”jupyter notebook”.

# 4 The numpy and matplotlib modules

We will be extensively using the numpy and matplotlib modules. Python has several ways to import modules. In this class, we will begin each file with

```
import numpy as np # for array and numeric stuff
import matplotlib.pyplot as plt # for plotting
```

which imports the numpy and matplotlib modules. Henceforth, I will always assume that you have imported these two packages in this way, as most tutorials and examples also do.

There is a lot that you can do with matplotlib and numpy, which you can learn about by searching the web.

# 5 ”=” is pronounced ”gets”

In this class, we will strive to always pronounce the symbol ”=” as ”gets.” This is because python (as well as C, and C++, and go, and rust, etc.) has two symbols that you might want to pronounce ”equals”.

One of those symbols is "=", and the other is "==". The former we will pronounce "gets", and typically causes one thing to be a name for some value or object. The latter, "==", we will pronounce as "equals" or "is equal to". "Equals" shows up when you test if two things are equal.

I don't expect you all to grasp this distinction at this stage of the class, but please do try to use this pronunciation throughout this course.

# 6 Writing functions

Normally in this course I expect you to Google for help when trying to figure out how to do any given task. However, the python tutorials on writing functions are pretty uniformly terrible. It's the only topic where I've found tutorials to be terrible, and it comes I expect of most of them being written for new programmers who don't understand algebra.

So here is a brief introduction to how to write functions in Python. A function definition begins with the `def` keyword, followed by the name of the function, and then its arguments in parentheses. This line is ended by a colon `:`. Then after indenting, you put the keyword `return` followed by the mathematical expression you want.

As an example, consider the function

$$f(x, y) = x^2 + y^2 \tag{1}$$

which is represented in Python as

```
def f(x, y):
    return x**2 + y**2
```

There is more that you could do, but hopefully this is enough to get you started. The `return` statement defines the value of the function, and is what tends to be left as an "advanced topic" by Python tutorials on writing functions. But functions without values aren't much use to physicists like you.

1. Write a python function that returns the function

$$f(x) = \frac{1}{\sqrt{x^2 + L^2}} \tag{2}$$

   where $L$ is a constant with dimensions of length.

2. Use matplotlib (and numpy) to plot $f(x)$ versus $x$.