The goals of this project are:

1. To observe patterns in sums and make conjectures
2. To describe patterns using formal mathematical notation
3. To use *Mathematica* to generate data and test conjectures

In this lab you will work in pairs on exercises 1.1.2, 1.1.3, and 1.1.4. Turn in one write-up per group.

Your write-up is due next Thursday at the beginning of lab. Follow the guidelines for writing up homework exercises. You may write up your results using *Mathematica*'s typsetting capabilities (or by hand if your handwriting is exceptionally clear). You can find a bunch of video tutorials on typsetting with *Mathematica* here.

If you are not familiar with *Mathematica*, I recommend that you take a look at some of the online video resources and tutorials. In particular, I recommend this ten-mintute intro video.

In Section 1.1 of the book, Shahriari gives examples of a few helpful commands in the computer algebra system Maple. Here are the corresponding commands in *Mathematica*.

To add up the first 622 odd numbers, type the following:

```
Sum[2*k + 1, {k, 0, 621}]
```

Then press `Shift` and `Enter` at the same time to evaluate.

To write a short program that shows the result of adding the first 2 odd numbers, then the first 3, then the first 4, ..., and finally the first 10 odd numbers:

```
For[n=1, n<11, n++, Print[Sum[2*k + 1, {k, 0, n}]]]
```

The command that gives an integer factorization is `FactorInteger`. It returns a list of the prime factors along with their powers. For example, `FactorInteger[24]` returns `{{2, 3}, {3,1}}` since $24 = 2^3 \cdot 3^1$.

To define the function $f(x) = \sin^2(x)$ and take its derivative:

```
f[x_] = (Sin[x])^2
f'[x]
```

To get *Mathematica* to give you a decimal approximation, use the `N` command:

```
a = Pi
b = N[a]
```