

# PHY499: Introduction to Python for Scientists

## Homework Assignment 3 (30 Sept, 2016)

(NOTE: This assignment will be graded!)

Only use functions, methods, and modules that we already discussed in class to solve these assignments! Send your code to `michael.mommert@nau.edu`.

### 1 Create your own Vector Math Module

Create a module that allows you to perform vector calculations, named `vector`. A vector can be simply defined as a list; e.g., the 3 dimensional unit vector in x-direction is defined as

`u_x = [1, 0, 0]`.

In order to create this module, all of its functions have to reside in a file called `vector.py`. These functions, which have to work on vectors of arbitrary length (if two vectors are provided to one function, they have to have the same length, of course), include

**add** add two vectors,

**subtract** subtract two vectors,

**mult** multiply two vectors element-wise,

**dotproduct** derive the scalar product between two vectors,

**absolute** derive the length of a vector,

**normalize** normalize the length of a vector to unity,

**angle** derive the vector between two angles; use  $\cos \Theta = (\vec{a} \cdot \vec{b}) / (|\vec{a}| |\vec{b}|)$ .

Each function has to have a documentation line that explains its purpose briefly and return its result. Be smart and use the simpler functions in the definition of the more complex ones.

You are only allowed to use the `math` functions in your own module, do not even think about using `numpy`!

In the same directory as `vector.py`, create a file to test the module that holds the following code:

```
import vector

a = [1, 2, 3]
b = [6, 5, 4]

v4 = [1, 1, 1, 1]

print vector.add(a,b)
print vector.subtract(b,a)
print vector.mult(a, [-1, -1, -1])
print vector.dotproduct(a,b)
print vector.absolute(v4)
print vector.normalize(v4)

print vector.angle([1,0,0], [0,1,0])
```

**Output:** Your module does not produce any output that is printed on the screen. Instead, it has to be designed in such a way that the test file printed above prints the correct results and does not produce an error.

If you want this assignment to count into your final grade, please submit it to  
`michael.mommert@nau.edu` before 6 Oct, 23:59!