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 CS 473  
 Artificial Neural Network  
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## Homework #1:

### Problem 1:

**1.1** Given:

$$f(x, y) = 2x\cos(y) + 2y\sin(x)$$

Find:

(a)

$$\frac{\partial f}{\partial x}$$

(b)

$$\frac{\partial f}{\partial y}$$

(a)  $\frac{\partial f}{\partial x} = 2\cos(y) + 2y\cos(x)$

(b)  $\frac{\partial f}{\partial y} = -2x\sin(y) + 2\sin(x)$

### Problem 2:

**2.1** Given:

$$\vec{w} = [0.5 \ 0.3 \ 0.8]^T$$

$$\vec{x} = [1.3 \ 1.7 \ 4.5]^T$$

Find:

(a) Using summation find

$$h = \sum_{i=1}^n w_i x_i$$

(b) Using dot product find

$$\vec{w}^T \vec{x}$$

As we discussed, the dot operator is just a convenience abstraction for the summation of each element. To take advantage of this abstraction in C++ I created a namespace where I overrode the `*` operator for vectors to return the summation of each element times the corresponding element of the second vector. The answer is 6.68.

```
1  #include <iostream>
2  #include <vector>
3
4  using namespace std;
5
6  namespace dp{//Create a namespace to allow use of "Dot Product" operator on std::vector
7      template<class T>
8      T operator*(vector<T> first, vector<T> second){
9          T temp = 0;
10         for (int i = 0; i < first.size(); ++i){
11             temp += (first[i] * second[i]);
12         }
13         return( temp );
14     }
15 }
16
17 int main( int argc, char** argv ){
18     vector<float> W{ 0.5, 0.3, 0.6, 0.8 };
19     vector<float> X{ 1.3, 1.7, 3.2, 4.5 };
20
21     using namespace dp;
22     cout << W * X << endl;
23     return(0);
24 }
```