1 I understand that a vector has direction and magnitude whereas a point doesn't.

However, the course note that I am using states that a point is the same as a vector.

Also, can you do cross product and dot product using two points instead of two vectors? I don't think so but my roommate insists yes and I'm kind of confused now.

2 The usual way of orienting the axes, with the positive x-axis pointing right and the positive y-axis pointing up (and the x-axis being the "first" and the y-axis the "second" axis) is considered the positive or standard orientation, also called the right-handed orientation.

A commonly used mnemonic for defining the positive orientation is the right hand rule. Placing a somewhat closed right hand on the plane with the thumb pointing up, the fingers point from the x-axis to the y-axis, in a positively oriented coordinate system.

3 I am trying to write a program with a function double_product(vector<double> a, vector<double> b) that computes the scalar product of two vectors. The scalar product is $a_{0}b_{0}+a_{1}b_{1}+...+a_{n-1}b_{n-1}$.

Eg:

```
#include <iostream>

#include <vector>

using namespace std;

class Scalar_product

{

    public:

    Scalar_product(vector<double> a, vector<double> b);

};

double scalar_product(vector<double> a, vector<double> b)

{

    double product = 0;

    for (int i = 0; i <= a.size()-1; i++)

        for (int i = 0; i <= b.size()-1; i++)

            product = product + (a[i])*(b[i]);

    return product;
```

```
}
int main() {
	cout << product << endl;
	return 0;
}
```

4 Parametric equation of the line through $\vec{P} =< p_1, p_2, p_3 >$ in the direction of a vector $\vec{v} =< v_1, v_2, v_3 >$:

$\vec{l}(t) =< x(t), y(t), z(t)) = \vec{P} + t\vec{v} =< p_1 + tv_1, p_2 + tv_2, p_3 + tv_3 >$.

Example: Find the parametric equation of the line through the points P=(1,-2,3) and Q=(-1,1,2).

Here we can take $\vec{v} = \vec{PQ} =< -2, 3, -1 >$ so $\vec{l}(t) =< 1, -2, 3 > +t < -2, 3, -1 >=< 1 - 2t, -2 + 3t, 3 - t >$. Note that when t=0 we are at P and when t=1 we are at Q.

If we wanted to orient the line starting at Q and toward P, I would have taken $\vec{v} = \vec{QP}$. and started at Q.