Vectors, Dot and Cross Product in Maple

In Maple, we'll be using the Vector Calculus and the "plots" packages. Therefore, the first two lines of code need to be typed and executed once in your worksheet. Here is a sample of commands that show you how to work with vectors in Maple.

```
# Name: (Put your name here)
with(VectorCalculus):
with(plots):
v:=<1,2,3>;
u:=<-1,1,1>;
c:=u+3*v;  #Addition and Scalar Multiplication
# Projection:
P:=(DotProduct(v,u)/DotProduct(u,u))*u;
N:=v-P;
with(Student[VectorCalculus]):
PlotVector([P,v,RootedVector(root=P,N)],color=['red','green','blue']);
# You may also work with symbolic vectors:
u1:=<a,b,c>;  # OOPS!  Clear c first:
c:='c';
# Now define it again:
u1:=<a,b,c>;
DotProduct(u1,u);
CrossProduct(u1,u);
```

Lab Questions

Answer these using Maple, then upload the Maple file to CLEO before Friday evening.

1. Check the distributive property of cross products. That is, see if it is true (using Maple) that:
$$\mathbf{a} \times (\mathbf{b} + \mathbf{c}) = (\mathbf{a} \times \mathbf{b}) + (\mathbf{a} \times \mathbf{c})$$

2. Check to see if the cross product is associative (again, using Maple):
$$(\mathbf{a} \times \mathbf{b}) \times \mathbf{c} = \mathbf{a} \times (\mathbf{b} \times \mathbf{c})$$

3. Check to see if the cross product is commutative:
$$\mathbf{a} \times \mathbf{b} = \mathbf{b} \times \mathbf{a}$$

4. Suppose $\mathbf{b} = \langle 1, -1, 2 \rangle$, $\mathbf{c} = \langle 2, 1, 3 \rangle$. Show, using various vectors $\mathbf{a}$, that Theorem 11, part 6 is true (by computing both sides of the equation).