MATH 261, Spring 2001 **Due Date:____________** **Name(s): ________________________**

Extra Project 13.5a: Vector Algebra, Lines and Planes

Objective

The objective of this project is to illustrate how Maple can be used to perform vector algebra.

Narrative

If you have not already done so, read Sections 13.2–13.5 in the text.

Tasks

Type the command lines in the left-hand column below into Maple in the order in which they are listed. The effect of each command is described in the right-hand column for your reference. Your lab report will be a hard copy of your typed input and Maple's responses.

`> # Project 13.5a:  Vector Algebra, Lines and Planes`	
`> restart:  with(linalg):`	Load Maple's Linear Algebra package
`> u := vector([3,-5,4]);`	Let $\mathbf{u} = \langle 3, -5, 4\rangle$.
`> u;`	What is $\mathbf{u}$?
`> evalm(u);`	What is $\mathbf{u}$?
`> u[1];`	What is the first entry of $\mathbf{u}$?
`> v := vector([1,2,-3]);`	Let $\mathbf{v} = \langle 1, 2, -3\rangle$.
`> w := u+v;`	Let $\mathbf{w} = \mathbf{u} + \mathbf{v}$.
`> evalm(w);`	What is $\mathbf{w}$?
`> 2*u;`	Multiply $\mathbf{u}$ by 2.
`> evalm(%);`	What is $2\mathbf{u}$?
`> dotprod(u,v);`	What is $\mathbf{u} \cdot \mathbf{v}$?
`> norm(u,2);`	What is $\|\|\mathbf{u}\|\|$?
`> angle(u,v);`	What is the angle between $\mathbf{u}$ and $\mathbf{v}$ (in radians)?
`> evalf(%);`	OK, ... give it to me as a real number!
`> crossprod(u,v);`	What is $\mathbf{u} \times \mathbf{v}$?
`> w := t*u+v;`	Let $\mathbf{w} = t\mathbf{u} + \mathbf{v}$.
`> r := evalm(w);`	Let $\mathbf{r}$ be the vector-valued function defined by $\mathbf{w}$.
`> x := unapply(r[1],t);`	Let x be the first component of $\mathbf{r}$.
`> y := unapply(r[2],t);`	Let y be the second component of $\mathbf{r}$.
`> z := unapply(r[3],t);`	Let z be the third component of $\mathbf{r}$.
`> r := ´r´;`	Reestablish r as a variable.
`> r := vector([x,y,z]);`	Let $\mathbf{r}$ be the vector whose components are x, y, and z.
`> dotprod(u,r-v)=0;`	This is the general equation of the plane passing through $P(\mathbf{v})$ whose normal vector is $\mathbf{v}$.
`> z = solve(%,z);`	This is the $z = f(x, y)$ form of equation of the plane passing through $P(\mathbf{v})$ whose normal vector is $\mathbf{v}$.

Comments

Observe that Maple can view and handle vectors both as objects and as arrays.