MATH 152 MATLAB Computer Lab 2

Cross Product, Determinant, Lines and Planes

Instructions

- Make sure to save the variable for each exercise with the correct variable name
- Download the file `data2.mat` from Canvas and upload to your MATLAB environment
- Save all variables to a file called `lab2.mat` and submit the file to Canvas
- Attend your scheduled lab section and visit MATLAB TA office hours for extra help

Exercise 1

Enter the first 3 digits of your student number as a vector $\mathbf{u}$ and enter the next 3 digits of your student number as a vector $\mathbf{v}$. Create another vector $\mathbf{w}$ using the last 2 digits of your student number along with the number 0. For example, if your student number is `12345678` then $\mathbf{u} = (1, 2, 3)$, $\mathbf{v} = (4, 5, 6)$ and $\mathbf{w} = (7, 8, 0)$. Compute the volume of the parallelogram spanned by $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ and save the result as `Ex1num`. Recall, the volume of the parallelogram spanned by vectors $\mathbf{u}$, $\mathbf{v}$, and $\mathbf{w}$ is the absolute value of the triple product

$$|\,\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w})\,|$$

Exercise 2

Consider the plane given in parametric form by

$$(1, 1, 2) + t\,(5, 1, 2) + s\,(3, 2, -1)$$

(a) Find a unit vector $\mathbf{n}$ which is orthogonal to the plane. Save the result as `Ex2Avec`.

(b) Compute the shortest distance from the point $P = (1, -2, 3)$ to the plane. Save the result as `Ex2Bnum`.

(c) Find the point Q which is the reflection of P through the plane. In other words, the vector PQ is orthogonal to the plane and the midpoint of PQ is on the plane. Save the result as `Ex2Cvec`.

Exercise 3

The file `data2.mat` contains a matrix `M` with 4 rows and 3 columns. Label the rows as A, B, C and D and let T be the tetrahedron with vertices A, B, C and D.

(a) Find the volume of the tetrahedron. Save the result as `Ex3Anum`. Note that the volume of the tetrahedron is 1/6 times the volume of the parallelogram spanned by any three edges attached to the same vertex.

(b) Find the shortest distance from vertex A to the plane containing the triangle BCD. Save the result as `Ex3Bnum`.