

MTH233

3-Dimensional Graphs

Project 1– Exercises

NAME: _____
SECTION: _____
INSTRUCTOR: _____

Exercise 1:

Use MATLAB to plot 2 vectors, a blue vector connecting the points $P = (1, -3, 5)$ and $Q = (3, 2, 6)$ and an equivalent red vector which has as its initial point the origin, $(0,0,0)$.

a.) What commands define the points p and q?

(1) Circle one:

1. `p=[3 2 6];q=[1 -3 5];`
2. `p=[1 -3 5];q=[3 2 6];`
3. `p=[5 -3 1];q=[3 2 6];`
4. not listed

b.) One or more of the following commands will plot the blue vector. Which ones are they?

(2) Circle all that apply:

1. `plot3([1 3],[-3 2],[5 6], 'b'),grid`
2. `plot3([p(1) q(1)],[p(2) q(2)],[p(3) q(3)], 'b'),grid`
3. `plot3([0 3],[0 2],[0 6], 'b'),grid`

c.) What command plots the equivalent red vector?

(3) Circle one:

1. `plot3([p(1) q(1)],[p(2) q(2)],[p(3) q(3)]),grid`
2. `hold on, plot3([0 q(1)-p(1)],[0 q(2)-p(2)],[0 q(3)-p(3)], 'r')`
3. `hold on, plot([0 q(1)-p(1)],[0 q(2)-p(2)],[0 q(3)-p(3)])`
4. not listed

d.) What does it mean for two vectors to be equivalent? (Note: “same direction” would necessarily imply being parallel, but the converse is not necessarily so.)

(4) Circle one:

1. if they are parallel
2. their magnitudes are the same
3. their directions are the same
4. their magnitude and direction are the same

Exercise 2:

a.) Compute $\text{dot}(u,c)$ and $\text{dot}(v,c)$ where $u = [3 \ -5 \ 1]$, $v = [3 \ 2 \ -2]$ and $c = [8 \ 9 \ 21]$

• $\text{dot}(u,c)=$

(5) Answer:

• $\text{dot}(v,c)=$

(6) Answer:

• What do your answers to $\text{dot}(u, c)$ and $\text{dot}(v, c)$ indicate?

(7) Circle all that apply:

1. u and v are perpendicular
2. $u \times v = c \rightarrow u \bullet c = v \bullet c = 0$
3. $u \bullet c = v \bullet c = 0 \rightarrow$ that u and v are mutually \perp to c
4. $u \bullet c = v \bullet c = 0$ is mere coincidence and has no implications

b.) Plot u in green, v in blue and c in red. Using view or the rotate tool, find a viewpoint which illustrates the relationship between \vec{u}, \vec{v} and \vec{c} . Submit the graph.

(8) Attach your graph to the worksheet.

Exercise 3:

Use MATLAB to graph the plane through the origin which contains the vectors $\vec{u} = \langle 6, 4, -1 \rangle$ and $\vec{v} = \langle -3, 12, 5 \rangle$. On the same graph, plot the cross product of these vectors. Experiment with the **view** and **axis** commands to obtain the best viewpoint that you can. (*Hint: It might be easier to graph the cross product if you can find a shorter vector in the same direction.*)

a.) What is your equation for the plane? $z =$

(9) Answer:

b.) Submit the graph of the plane and cross product on one graph.

(10) Attach your graph to the worksheet.

Exercise 4:

Use MATLAB to graph the following surfaces. Use **subplot** and print all of these graphs on one sheet! Label the graphs. Change the view on each graph to highlight the behavior of the graph near the origin. Based on your graphs, try to determine the value of the function when $x=0$ and $y=0$ – if it exists.

a.) Plot the following functions, and compute $f(0, 0)$ if it exists:

1.) $z_1 = x^2 + y^2$

At $x = 0, y = 0, z_1 = ?$

(11) Answer:

2.) $z_2 = e^{x^2+y^2}$

At $x = 0, y = 0, z_2 = ?$

(12) Answer:

3.) $z_3 = 1/(x^2 + y^2)$

At $x = 0, y = 0, z_3 = ?$

(13) Answer:

4.) $z_4 = \sin(x^2 + y^2)/(x^2 + y^2)$

At $x = 0, y = 0, z_4 = ?$

(14) Answer:

b.) Submit the graph.

(15) Attach your graph to the worksheet.

Recall that the `subplot` command divides the graphing window into separate plotting areas and allows you to put many graphs on one page. The command `subplot(3,3,1)` will be the upper left most plot in a three row by three column plot.