Maple Funsheet 1

MATH 249-02
Monday, September 15, 2008

Directions: Work in MAPLE. This worksheet is just to get you somewhat familiar with the basics of MAPLE. By the end of the day on Friday, September 19, e-mail me your MAPLE worksheet as an attachment **with all output deleted**. I will return my comments by replying. Please turn in a group worksheet, but be sure to enter all group members' names at the beginning. Also, I do not want to see all of your scratch work: turn in as clean a MAPLE file as possible. (I do want to see your commands, though.)

Work together on each problem; do not delegate different problems to different people.

NOTE: When you submit your worksheet, include the names of all group members in the subject line of your e-mail as well as at the top of the file itself.

You will need the **with(plots):** and **with(VectorCalculus):** commands for these exercises. Note that many commands and examples are available on my webpage. You should also make liberal use of the MAPLE help system as needed.

Here are just a few tips to get you started.

1. If a command gives you an error, you do not need to retype it. You can use the arrow keys or your mouse to go up to where you gave the command and just edit it there. Once you are finished, you can just hit <enter>; you do not need to go to the end of the line.

2. The % symbol works like the ANS button on your TI calculator. It represents the last **output** from Maple. Note that this is not necessarily from the line right above where you use the % symbol.

3. Do not necessarily look for a command to do the problem in one step. You have all of the tools and commands you need to do the problems on this worksheet, but Maple will do the actual computations for you.

4. Commands in Maple generally mimic our usual function notation. That is, if the command requires information (like a **plot** command requires the function to plot and what range the variables should take), then the information goes inside of parentheses after the command name: **plot(3*x+1,x=-4..6);**.

Exercises

1. Use the dot product in MAPLE to find the length of $< 3, -2, 4 >$. Then find a unit vector in the direction of $< 3, -2, 4 >$.

2. (a) Use MAPLE to find the angle between $< 2, 4, -3 >$ and $< -1, 3, -2 >$. Use the **evalf** command to find a decimal approximation. [evalf(whatever);]

   (b) Use the **arrow** command to draw the vectors $< 2, 4, -3 >$ and $< -1, 3, -2 >$ on the same set of axes (and show the axes). The **arrow** command works as follows:

   arrow($< 1, 2, 3 >, < 3, 4, 5 >$**);**

   draws an arrow from $(1, 2, 3)$ to $(3, 4, 5)$. (Note that these are not the vectors you were given.) To draw an arrow from the origin, you may simply omit the first vector. You can also use a vector's name if you have given it one (like **v:=**$< 3, 4, 5 >$**;**). Use Maple's help to play with the display options for the arrow until it looks like you want it to. To draw different arrows from the same initial point, enclose the set of ending points in curly braces. For example:

   arrow($< 1, 2, 3 >, \{< 1, 7, 5 >, < 2, 4, 1 >\}$**);**

   (c) Find a vector perpendicular to both $< 2, 4, -3 >$ and $< -1, 3, -2 >$ and graph it with those two vectors.

3. Use MAPLE to do Exercise 43 in 12.4 of your text. Note that the vectors **a, b,** and **c** need to be generic (like **a**:=$< a1, a2, a3 >$).

4. Plot and identify each conic section. Use the text prompt (CTRL T, or use the text prompt button at the top of the page) to enter text responses.

(a) $x^2 + 4y^2 = 16$

(b) $x^2 - 4y^2 = 16$

(c) $-x^2 + 4y^2 = 16$

(d) $y = 6x^2 = 2$

How can you tell which way a hyperbola will open based on its equation?

5. Give Maple the following inputs and describe the outputs. (I am looking for a geometrical description.) You may find section 12.6 in your text helpful in finding names for some. For parts (c)-(h), also describe the x-, y-, and z-traces. (That is, what kind of curve is the cross section when x is held constant? y? z?)

   (a) plot3d(`sqrt(x^2+y^2)`,x=-5..5,y=-5..5,axes=boxed);

   (b) plot3d($< t+2, 3*t-1, 2*t+1 >, t=-5..5, s=0..1$,axes=boxed);

   (c) implicitplot3d(`x^2+y^2+z^2=4`, x=-5..5,y=-5..5,z=-5..5,axes=boxed,numpoints=5000);

   (d) implicitplot3d(`x^2+y^2=z^2`, x=-5..5,y=-5..5,z=-5..5,axes=boxed,numpoints=5000);

   (e) implicitplot3d(`x^2+4*y^2=16`, x=-5..5,y=-5..5,z=-5..5,axes=boxed,numpoints=5000);

   (f) implicitplot3d(`x^2+y^2-z^2=4`, x=-5..5,y=-5..5,z=-5..5,axes=boxed,numpoints=5000);

   (g) implicitplot3d(`-x^2-y^2+z^2=4`, x=-5..5,y=-5..5,z=-5..5,axes=boxed,numpoints=5000);

   (h) implicitplot3d(`z=x^2-4*y^2`, x=-5..5,y=-5..5,z=-5..5,axes=boxed,numpoints=5000);

6. For part (g) above, plot the plane $x = 1$ on the same set of axes. To do this, enclose in one pair of curly braces both equations you are plotting where you would originally put the single equation to plot. You will need to separate the equations with a comma.

7. (a) Use Maple to obtain graphs of $y = 3$ and $z = 5$ (as in the 12.1 homework) on the same set of axes. (You will need to use **implicitplot3d** for this.)

   (b) Now use the **animate** command to slide the plane $y = 3$ toward the xz-plane. Call out for R2D2 to stop the trash compactor. (You will need to look up the **animate** command in help; you can also look on my webpage for examples.)