MATH 251 Maple Lab 3

Sections H1-H3

September 2, 2015

You are encouraged to discuss this assignment with other students and with the instructors, but the work you hand in should be your own. The web page

`http://www.math.rutgers.edu/courses/251/Maple/Lab3/Quadrics.html`

can help you with this assignment; to find it, follow the "Maple in Math 251" link on the the Math 251 course webpage.

A web page will be posted listing individual data for each student. For this lab the data will be two functions and three constants.

- The first function, $F(x, y)$, will be a second degree polynomial of two variables (x and y). There will also be a specific value given for x, let's say $x = A$.
- The second function, $G(x, y, z)$, will be a second degree polynomial of two variables (x, y, and z). There will also be a value given for x and a value given for y, let's say $x = B$ and $y = C$.

Use `Maple` to help you answer the following questions.

What kind of curve is $F(x, y) = 0$? Is it a hyperbola, a parabola, or an ellipse? For which values of y is (A, y) on the curve $F(x, y) = 0$? (Usually there will be two values of y, but you may be lucky, and there may be only one.) For each of these values of y, use `Maple` to compute a vector normal to the curve $F(x, y) = 0$ at the point (A, y). Then use `Maple` to draw this vector or vectors, together with the curve $F(x, y) = 0$.

What kind of surface is $G(x, y, z) = 0$? Is it a cylinder (what type of cylinder?), a cone, a paraboloid (what type of paraboloid?), an ellipsoid, or a hyperboloid (what type of hyperboloid?). For which values of z is (B, C, z) on the curve $G(x, y, z) = 0$? (Usually there will be two values of z, but you may be lucky, and there may be only one.) For each of these values of z, use `Maple` to compute a vector normal to $G(x, y, z) = 0$ at (B, C, z). Then use `Maple` to draw this vector or vectors, together with the surface $G(x, y, z) = 0$.

This assignment is due **October 22, 2015** in recitation. Late submissions will *not* be accepted.

Please hand in a printout of all Maple instructions that you use. You must print out the assignment and hand it in to me.

- All pages should be labeled with your name and section number. Also, please *staple* together all the pages you hand in.
- **You should clean up your submission by removing the instructions that had errors.**

The work that you hand in should include:

1. A clear picture of $F(x, y) = 0$, **including your identification of the type of the curve**. Show evidence for your assertion. The identification can be done "by hand" on your printout.
2. The coordinates of the point or points (A, y) in your computations.
3. A second picture of the curve $F(x, y) = 0$, which shows also the normal vectors at point(s) (A, y). Select the picture carefully. It should show the vectors as perpendicular to the curve.
4. A clear picture of the surface $G(x, y, z) = 0$, **including your identification of the type of the surface**. You may give several pictures; select your views carefully to show evidence for your assertion. The identification can be done "by hand" on your printout.

5. The coordinates of the point or points (B, C, z) in your computations.

6. A further picture or pictures of the curve $G(x, y, z) = 0$, which show also the normal vectors at point(s) (B, C, z). You may need to give several views of this picture; select your views carefully so that so that the vectors are shown as perpendicular to the surface.

Remark: The background information for these labs suggests drawing vectors using the `spacecurve` command, which is fine. There is also an `arrow` command, which gives plots tht look more like vectors but is rather tricky to use. Experiment with it if you like.