

A web page which can help you with this assignment will be linked to the course webpage. You are encouraged to discuss this assignment with other students and with the instructors, but the work you hand in should be your own.

Every student will receive an e-mail message with two functions and other data.

- 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  $F(x, y) = 0$ . 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  $G(x, y, z) = 0$ . Then use Maple to draw this vector or vectors, together with the surface  $G(x, y, z) = 0$ .

This assignment is due **Wednesday, April 5, 2006**.

**Please hand in the following material:**

0. All pages should be labeled with your name and section number. Also, please *staple* together all the pages you hand in.
1. A printout of all Maple instructions you have used. (Yes, you may and should “clean up” by removing the instructions that had errors.)
2. A clear picture of  $F(x, y) = 0$  including your identification of the curve. The identification can be done “by hand” on your printout. Show evidence for your assertion.
3. Indicate clearly the coordinates of the point or points  $(A, y)$  in your computations.
4. A picture of the curve  $F(x, y) = 0$  together with the normal vectors. Select the picture carefully. It should show the vectors as perpendicular to the curve.
5. A clear picture of  $G(x, y, z) = 0$  including your identification of the surface. You may give several pictures and select your views carefully. The identification can be done “by hand” on your printout. Show evidence for your assertion.
6. Indicate clearly the coordinates of the point or points  $(B, C, z)$  in your computations.
7. A picture of the curve  $G(x, y, z) = 0$  together the normal vectors. Select the picture carefully. It should show the vectors as perpendicular to the surface. You may need to give several views of this picture and select your views carefully.