# *MAT331 Exercises, Spring 12*

*set number* 4

15. (*expires 3/1*) The file edata.txt on the class website defines a list called `edata`; these points approximate an ellipse of the form

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

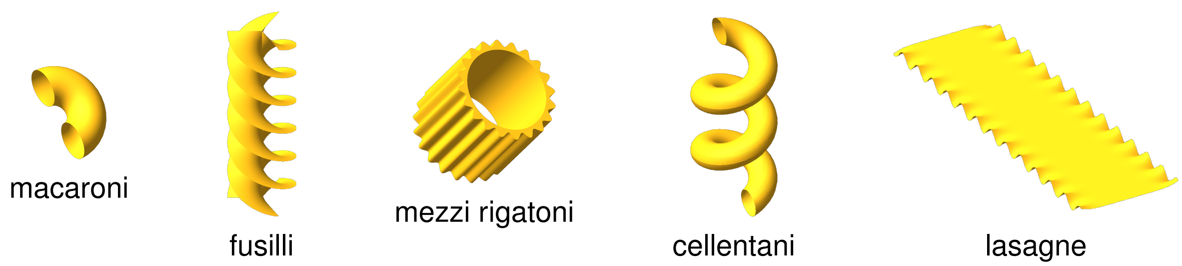
Adapt the method we used in class (and in section 6 of the notes) to find the ellipse that best fits this data.

Then plot both the points in `edata` and the ellipse on the same graph. Make sure the view in your plot is such that your ellipse looks like an ellipse instead of a circle.

You might find it helpful to know that the ellipse above can be described in parametric form as

$$x = a\cos(\theta) \quad y = b\sin(\theta), \qquad 0 \le \theta < 2\pi.$$

16. (*expires 3/8*) Use `Maple` to make pictures of the following pasta.




Here are some relevant equations, in no particular order.

$$z = \sin(2y)\left(1 - e^{-(x/6)^8}\right) \quad -6 \le x \le 6, \quad -20 \le y \le 20$$

$$\tau = 1 \quad 0 \le \phi \le \pi, \quad -\pi \le \sigma \le \pi \quad \text{(toroidal coordinates)}$$

$$x = \left(1 + \frac{\cos(s)}{2}\right)\cos(t) \quad y = \left(1 + \frac{\cos(s)}{2}\right)\sin(t) \quad z = 0.4t + \frac{\sin(s)}{2} \qquad \begin{array}{c} 0 \le s \le 2\pi \\ \frac{\pi}{2} \le t \le \frac{11\pi}{2} \end{array}$$

$$\left\{\begin{array}{ccc} x = r\sin(t) & y = r\cos(t) & z = t/2 \\ x = r\sin\left(t + \frac{2\pi}{3}\right) & y = r\cos\left(t + \frac{2\pi}{3}\right) & z = t/2 \\ x = r\sin\left(t - \frac{2\pi}{3}\right) & y = r\cos\left(t - \frac{2\pi}{3}\right) & z = t/2 \end{array}\right\} \qquad \begin{array}{c} 0 \le r \le 1 \\ 0 \le t \le 4\pi \end{array}$$

$$6 \le r \le 7 + \sin(20\theta)/2, \quad 0 \le \theta \le 2\pi, \quad 0 \le z \le 14 \qquad \text{(cylindrical coordinates)}$$

To help you get started, the `Maple` worksheet called pasta.mw draws Mezzi Rigatoni. For full credit, your pasta should look like pasta, with appropriate coloring, viewpoint, smoothness, and lighting. Sauce is optional.