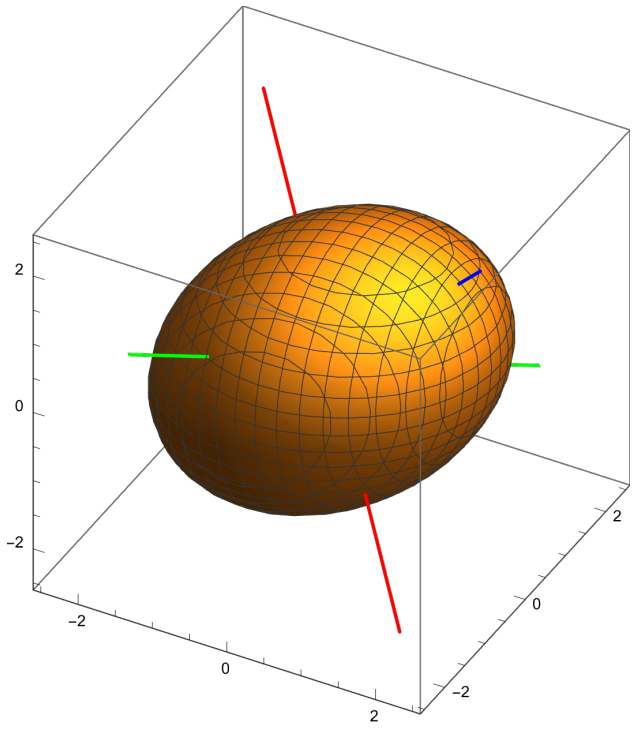
PHYS2502 Mathematical Physics Lab #11 10 Apr 2022

This lab assignment is at 8am, the morning after the date shown, although you should able to complete it easily before the end of the lab period. When you're done, upload your code to the github *repository, and a PDF of your output to the* canvas *page for the course.*

The following equation describes a "tilted" ellipsoid in three dimensional space:

$$17x^2 - 4xy - 10xz + 20y^2 + 4yz + 17z^2 = 72$$

In this lab, you are to create the following plot, embellished however you would like, that shows this ellipsoid in space, with its symmetry axes drawn in three different colors:



The procedure is the same as we followed in class (for the 2D example), and for the 3D example in your homework. That is, you need to express the ellipsoid equation using a symmetric real matrix, and then find its eigenvalues and eigenvectors.

Plotting the ellipsoid in 3D is easy using ContourPlot3D in MATHEMATICA. I suggest that you remove the effective of perspective using the ViewProjection → "Orthographic" option.

Plot the symmetry axes, which are in the directions of the eigenvectors, using the function ParametricPlot3D. It is easy to parameterize the lines as $v^{(i)}t$ for eigenvector i.

Combine the ellipsoid plot with the three symmetry axis lines using Show to get something like the figure above.