Checkpoint: Traces and level curves

Consider the functions $C(x,y) = 2x^2 + y^2$ and $S(x,y,z) = x^2 + y^2 + z^2$. (Notice that S is, like, a 4-dimensional function – three inputs and one output.)

(a) Write equations and sketch graphs for the $y = -2$, $y = 0$, and $y = 2$ traces of C.

(b) Write equations and sketch graphs for the $x = -2$, $x = 0$, and $x = 2$ traces of C.

(c) What can you say about the general shape of x-traces of this function? How about y-traces? How are they similar and how are they different?

(d) Write equations and sketch graphs for the level curves of C at 0, 2, and 4.

(e) What can you say about the general shape of the contours of this function?

(f) Why didn't I ask about contours at -2 or -4?

(g) Write an equation for the contour of S at 1.

(h) What's this equation?
(Hint: you can graph it in CalcPlot3D if you use the "implicit surface" option.)

(i) Maybe now I can't call this a "level curve" but instead I should call it a "level surface." Why?