

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use EQUAL SIGNS and arrows when appropriate. Always SIMPLIFY expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type (Maple, GC).

Consider the two spheres:  $x^2 + y^2 + z^2 = 100$ ,  $x^2 + y^2 + z^2 = 6x + 8y + 24z$ .

- What is the distance between the centers of these two spheres?
- If  $P_0(x_0, y_0, z_0)$  is the center of the second sphere, then the point  $P_1$  with coordinates  $(x_1, y_1, z_1) = (tx_0, ty_0, tz_0)$  with  $t > 0$  lies on the line segment connecting the two centers. What value of  $t$  corresponds to the point on the first sphere and what are the coordinates of this point? This is the point on the first sphere closest to the center of the second sphere.
- What fraction of the distance between the centers does the separation of the two points  $P_0, P_1$  represent?
- What is the highest point on the larger sphere?
- Make a rough hand sketch of a plane cross-section through the line joining the centers (made horizontal for the 2d diagram) and locate the two circles in that plane with their radii and separation. Does your answer to part c) look reasonable?

► **solution**