For more on level sets (the book calls them level curves and level surfaces) see pgs 968-969.

1) Do the following problems in section 14.1: 13-18 (these do not require any computation)

2) Find the level sets in $\mathbb{R}^2$ for the following functions:

$f(x, y) = xy - 1$

$g(x, y) = e^{-(4x^2+4y^2)}$

$h(x, y) = y^2 - x^3 - x$

By "find" I mean draw the shapes of the level sets and the values which correspond to those shapes. You do not need to draw them all, but make sure to get the different types (different number of components, infinite versus bounded, etc).

3) Describe the level surfaces for the function

$$d(x, y, z) = z - \frac{1}{1 - x^2 - y^2}$$

Hint: first solve for z. Then consider that $x^2 + y^2$ is r^2 where r is the distance from (x, y) to the origin in $\mathbb{R}^2$.

4) This one is solely for those who are interested; it won't come up anywhere else in the course: Can you divide the open unit disc $\{(x, y)|x^2 + y^2 < 1\}$ into the union of two non-empty open subsets, O_1 and O_2 that are also disjoint? So we want (open) O_1 and O_2 with $D = O_1 \cup O_2, O_1, O_2 \neq \emptyset$, and $O_1 \cap O_2 = \emptyset$?