HW. # 5

Homework problems are taken from textbook. The problems are color coded to indicate level of difficulty. The color green indicates an elementary problem, which you should be able to solve effortlessly. Yellow means that the problem is somewhat harder. Red indicates that the problem is hard. You should attempt the hard problems especially.

Sketch or describe the level curves. (Hint: If you understand the pattern of the level curves, they you can plot a generic level curve instead of doing many drawings)

1. (a) $f(x,y) = 4 - 3x + 2y$, c = 0, 1, 2, 3, -1, -2, -3

   (b) $f(x,y) = (x^2 + y^2)^{\frac{1}{2}}$, c = 0, 1, 2, 3, 4, 5

   (c) $f(x,y) = \frac{x}{y}$, c = 0, 1, 2, 3, -1, -2, -3

2. Sketch or describe the graph of

   (a) $f(x,y) = (x^2 + y^2)^{\frac{1}{4}}$

   (b) $f(x,y) = \ln[(x^2 + y^2)^{\frac{1}{2}}]$

   (c) $f(x,y) = \frac{1}{x^2 + y^2}$

3. Sketch or describe the graph of

   (a) $f(x,y) = |x|$

   (b) $f(x,y) = Cos(y)$

   (c) $f(x,y) = \frac{1}{x}$

4. Sketch or describe the graph of

   (a) $f(x,y) = \sqrt{\frac{x^2}{16} + \frac{y^2}{9}}$

   (b) $f(x,y) = \frac{x^2}{9} + \frac{y^2}{16}$

5. Sketch or describe the graph of

   (a) $f(x,y) = \max(|x|, |y|)$

   (b) $f(x,y) = \frac{2xy}{x^2 + y^2}$

6. Sketch or describe the given surfaces.

(a) $\frac{x^2}{4}+\frac{y^2}{9}+z^2=1$

(b) $\frac{x^2}{4}+z^2=25$

(c) $x^2-y^2+16z^2=0$

(d) $x^2+y^2+z-1=0$

7. Analyze the equation $-\frac{x^2}{a^2}-\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ and sketch its graph. Its graph is called a **hyperboloid of two sheets**.

8. Analyze the equation $\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}=1$ and sketch its graph. Its graph is called a **hyperboloid of one sheet**.

9. Sketch the solid region bounded by the given surfaces.

(a) $z=x^2+y^2$ and $z=4-x^2-y^2$

(b) $z^2=x^2+y^2$ and $z=x^2+y^2-3$

10. Sketch or describe the graph of

(a) $f(x,y)=Sin(x)-y^2$

(b) $f(x,y)=\frac{1}{x}+y$