

## HEDVA2.ME. SPRING 2014. HOMEWORK 3.5

This is an additional set of questions. It is **not** for submission

1. Draw the following domains in  $\mathbb{R}^2$ :  
a.  $\{|x| + |y| \leq 1\} \subset \mathbb{R}^2$ ,    b.  $\{|2x - y| + |2y - x| \leq 1\} \subset \mathbb{R}^2$ ,    c.  $\{x^{\frac{2}{3}} + y^{\frac{2}{3}} \leq 1\}$ ,    d.  $\{x^{\frac{4}{3}} + y^{\frac{4}{3}} \leq 1\}$   
e.  $\{-1 \leq xy \leq 1, -1 \leq x - y \leq 1\}$ ,    f.  $\{-1 \leq xy \leq 1, -1 \leq \frac{x}{y} \leq 1\}$
2. Draw the curves in  $\mathbb{R}^2$  (here  $r, \phi$  are the polar coordinates):  
a.  $\{r = \cos(\phi)\}$ ,    b.  $\{r = |\cos(\phi)|\}$ ,    c.  $\{r = |\sin(6\phi)|\}$ ,    d.  $\{r = \phi, \phi \in (-\infty, \infty)\}$ ,  
e.  $\{xy = 0\}$ ,    f.  $\{(x - y)(x + y) = 0\}$ ,    g.  $\{x(x - 1)(x + 1) = 0\}$
3. Draw the following surfaces in  $\mathbb{R}^3$ . In each case describe the sections by the planes  $\{x = x_0\}$ ,  $\{y = y_0\}$ ,  $\{z = z_0\}$ .  
a.  $\{z = x^2 + y^2 - 5\}$ ,    b.  $\{z = x^2 - y^2\}$ ,    c.  $\{z = -x^2 - y^2 - 5\}$ ,    d.  $\{z = xy\}$   
e.  $\{z^2 = x^2 + y^2 - 1\}$ ,    f.  $\{x^2 = z^2 + y^2 + 1\}$ ,    g.  $\{(x - 1)(y + 1)(z + 2) = 0\}$ ,  
h.  $\{z = \sin(x)\}$ ,    i.  $\{z = \sin(x^2 + y^2)\}$
4. Draw the topographic curves ("kavei rama/gova") for the functions below.  
Try to restore the graphs of functions using this information.  
a.  $f(x, y) = x + y$ ,    b.  $f(x, y) = \frac{x}{y}$ ,    c.  $f(x, y) = \sqrt{x^2 - y^2}$ ,  
d.  $f(x, y) = \frac{1}{x^2 + 2y^2}$ ,    e.  $f(x, y) = |x| + |y| - |x + y|$