Math 33A Fall 2005 Homework Assignments Eberlein

HW # 4 due Wednesday September 28

9.7 # 3a, 4a, 5a, 6a, 7a, 9a, 11, 12, 13, 15, 18, 21
10.2 # 9, 11, 15, 16, 19, 20

Extra Problems

1. Draw a picture exhibiting the shape of each of the following graphs :
   a) $z = 5x^2 + 2xy + 3y^2 + 4x - 2y + 6$
   b) $z = 5x^2 + 10xy + 2y^2 + 2x + 5y + 9$

2. Let A be a 3 x 3 matrix, Let x,y be points in $\mathbb{R}^3$, regarded as column vectors = 3 x 1 matrices. Suppose that $Ax \cdot Ay = x \cdot y$ (dot products) for all x,y in $\mathbb{R}^3$.

a) Show that if x is a vector of length 1, then Ax (matrix multiplication) is also a vector of length 1.

b) Show that the angle between x and y equals the angle between Ax and Ay for all vectors x,y in $\mathbb{R}^3$.

c) Prove that $A^t x \cdot A^t y = x \cdot y$ (dot products) for all x,y in $\mathbb{R}^3$, where A^t denotes the transpose of the matrix A,
(Hint : In part c) use the results of problems 2) and 3) in HW # 3)