Math 33A Fall 2005 Homework Assignments Eberlein

HW # 1 due Wednesday September 7

9.1 # 7, 9ab,11, 12, 16
9.2 # 7, 8, 9, 11, 12, 15, 19

HW # 2 due Wednesday September 14

9.3 # 13,16, 23, 25
9.4 # 7, 13, 15, 17, 21
9.5 # 3, 5, 6, 10, 19, 21, 27, 47

Extra problems : Let $R_\theta : \mathbb{R}^2 \to \mathbb{R}^2$ be the counterclockwise rotation through an angle theta defined by $R_\theta(x,y) = (x\cos\theta - y\sin\theta,\ x\sin\theta + y\cos\theta)$.

1. Prove that R_θ preserves distances ; that is, if P,Q are any points of $\mathbb{R}^2$, then $d(R_\theta(P), R_\theta(Q)) = d(P,Q)$ or equivalently $|R_\theta(P) - R_\theta(Q)| = |P - Q|$. (Hint : Write P = (x,y) , Q = (a,b) and calculuate both sides of the equality in tems of x,y,a,b and θ.)

2. Prove that R_θ preserves the dot product ; that is, if P,Q are any points of $\mathbb{R}^2$, then $(R_\theta(P)\cdot(R_\theta(Q)) = P\cdot Q$. (Hint : Write P and Q as in 1. and calculate both dot products.)

3. If R_θ denotes the matrix $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then prove that $R_\theta R_\theta{}^t = R_\theta{}^t R_\theta = Id$, the identity matrix. Here $R_\theta{}^t$ denotes the transpose of R_θ..

4. Compute the product matrix AB in each of the following cases :

a) $A = \begin{bmatrix} 2 & 3 \\ -4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 5 \end{bmatrix}$

b) $A = \begin{bmatrix} 8 & -9 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$

c) $A = \begin{bmatrix} 5 & 1 \\ -2 & 4 \\ 6 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ -3 & 4 & 6 \end{bmatrix}$