CS411 - Assignment 0 Ayesha Ahmed 8/30/2016

Problem A:

1) 2A – B = <-2, -1, 0>

2) ||A|| = $\sqrt{14}$ with angle 74.5 degrees relative to the x axis

3) A-hat = $\frac{1}{\sqrt{14}}$<1, 2, 3>

4) alpha = cos a =$\frac{1}{\sqrt{14}}$ = 0.267, beta = cos b =$\frac{2}{\sqrt{14}}$ = 0.267, ebsilon = cos b =$\frac{3}{\sqrt{14}}$ = 0.267

5) A•B = B•A = 32

6) 12.93 degrees

7) <1,1,-1>

8) AxB = <-3,6,-3>, BxA = <3,-6,3>

9) $\frac{1}{\sqrt{54}}$<-3,6,-3>

10) Linearly Dependent: Gaussian Elimination: $\begin{bmatrix} 1 & 0 & 3 \\ 0 & 1 & -1 \\ 0 & 0 & 0 \end{bmatrix}$

Problem B:

1) $\begin{bmatrix} 1 & 2 & 5 \\ 6 & -5 & 10 \\ -3 & 12 & -3 \end{bmatrix}$

2) AB = $\begin{bmatrix} 14 & -2 & -4 \\ 9 & 0 & 15 \\ 7 & 7 & -21 \end{bmatrix}$ BA = $\begin{bmatrix} 9 & 3 & 8 \\ 6 & -18 & 13 \\ -5 & 15 & 2 \end{bmatrix}$

3) $(AB)^T = B^T A^T =$ $\begin{bmatrix} 14 & 9 & 7 \\ -2 & 0 & 7 \\ -4 & 15 & 21 \end{bmatrix}$

4) |A| = 55, |C| = 0, So, matrix A is linearly independent because determinant is non-zero.

5) If $AA^T = I$ then all the rows are orthogonal which makes the matrix an orthogonal set.

$AA^T =$ $\begin{bmatrix} 14 & 9 & 7 \\ 9 & 29 & -13 \\ 7 & -13 & 26 \end{bmatrix}$ $BB^T =$ $\begin{bmatrix} 6 & 0 & 0 \\ 0 & 21 & 0 \\ 0 & 0 & 14 \end{bmatrix}$ = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ $CC^T =$ $\begin{bmatrix} 14 & 32 & 10 \\ 32 & 77 & 19 \\ 10 & 19 & 11 \end{bmatrix}$

So, only matrix B has orthogonal rows.

6) $A^{-1} =$ $\begin{bmatrix} -13/55 & 17/55 & 12/55 \\ 4/55 & -1/55 & 9/55 \\ 4/11 & -1/11 & -2/11 \end{bmatrix}$ $B^{-1} =$ $\begin{bmatrix} 1/6 & 2/21 & 3/14 \\ 1/3 & 1/21 & -1/7 \\ 1/6 & -4/21 & 1/14 \end{bmatrix}$

Problem C:

1) $f'(x) = 2x$ $f''(x) = 2$

2) $\frac{\partial g}{\partial x} = 2x$ $\frac{\partial g}{\partial y} = 2y$