MATH 293 PRELIM 1 SPRING 1990 # 5

3 a)

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 3x_1 \\ 2x_2 \end{bmatrix}$$

$ax_1 + bx_2 = 3x_1 \Rightarrow b=0 \quad ax_1 = 3x_1 \Rightarrow a=3$

$cx_1 + dx_2 = 2x_2 \Rightarrow c=0, \; dx_2 = 2x_2 \Rightarrow d=2$

$$A = \begin{bmatrix} 3 & 0 \\ 0 & 2 \end{bmatrix}$$

MATH 293 PRELIM 2 SPRING 1992 #1

#6 a)

$$\begin{bmatrix} 1 & 2 & 3 \\ 3 & 1 & 2 \\ 2 & 3 & 1 \end{bmatrix} \begin{bmatrix} 5 \\ 7 \\ 9 \end{bmatrix} = \begin{bmatrix} 5+14+27 \\ 15+7+18 \\ 10+21+9 \end{bmatrix} = \begin{bmatrix} 46 \\ 30 \\ 40 \end{bmatrix}$$

b)

$$\begin{bmatrix} 0 & 1 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} 5 & 7 \\ 9 & 11 \end{bmatrix} = \begin{bmatrix} 0+9 & 0+11 \\ 10+0 & 14+0 \end{bmatrix} = \begin{bmatrix} 9 & 11 \\ 10 & 14 \end{bmatrix}$$

MATH 293 P(7/21) SUMMER 1992 #1

#7.

a) $AB = \begin{bmatrix} -1 & 2 & 3 \\ 4 & 1 & -5 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & -1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} -1+0+3 & -2-2+3 \\ 4+0-5 & 8-1-5 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$

b) $BA = \begin{bmatrix} 1 & 2 \\ 0 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} -1 & 2 & 3 \\ 4 & 1 & -5 \end{bmatrix} = \begin{bmatrix} -1+8 & 2+2 & 3-10 \\ 0-4 & 0-1 & 0+5 \\ -1+4 & 2+1 & 3-5 \end{bmatrix} = \begin{bmatrix} 7 & 4 & -7 \\ -4 & -1 & 5 \\ 3 & 3 & -2 \end{bmatrix}$

c) $A(BC) = \begin{bmatrix} -1 & 2 & 3 \\ 4 & 1 & -5 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} -1 & 1 & 0 & -3 & 2 \\ 0 & 2 & 1 & -1 & 1 \end{bmatrix}$

$$= \begin{bmatrix} -1 & 2 & 3 \\ 4 & 1 & -5 \end{bmatrix} \begin{bmatrix} -1 & 5 & 2 & -5 & 4 \\ 0 & -2 & -1 & 1 & -1 \\ -1 & 3 & 1 & -4 & 3 \end{bmatrix} = \begin{bmatrix} -2 & 0 & 2 & -5 & 3 \\ 1 & 3 & 2 & 1 & 0 \end{bmatrix}$$

d) $CB = \begin{bmatrix} -1 & 1 & 0 & -3 & 2 \\ 0 & 2 & 1 & -1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & -1 \\ 1 & 1 \end{bmatrix}$ DNE

Section 1.6

MATH 293 FINAL SPRING 1996 # 34

14) FALSE, ORDER MATTERS IN MATRIX MULTIPLICATION

$$(A+B)(A+B) = A^2+AB+BA+B^2$$

MATH 293 FINAL SPRING 1996 #35

16) TRUE.

$$(A^TB^T)^T = (B^T)^T(A^T)^T = BA \qquad \text{(THEOREM 3 p. 106)}$$

MATH 294 PRELIM 1 FALL 1997 #1

#16. a)

$$\left[\begin{array}{cccc|c} 0 & 1 & 1 & -1 & 1 \\ 1 & -1 & 0 & 2 & 3 \\ -1 & 2 & 1 & -3 & -2 \end{array}\right] \xrightarrow{\text{SWITCH ROW1, ROW2}} \left[\begin{array}{cccc|c} 1 & -1 & 0 & 2 & 3 \\ 0 & 1 & 1 & -1 & 1 \\ -1 & 2 & 1 & -3 & -2 \end{array}\right] \xrightarrow{\text{ROW3 + ROW1}} \left[\begin{array}{cccc|c} 1 & -1 & 0 & 2 & 3 \\ 0 & 1 & 1 & -1 & 1 \\ 0 & 1 & 1 & -1 & 1 \end{array}\right]$$

$$\xrightarrow{\text{ROW3 - ROW2}} \left[\begin{array}{cccc|c} 1 & -1 & 0 & 2 & 3 \\ 0 & 1 & 1 & -1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right] \xrightarrow{\text{ROW1 + ROW2}} \left[\begin{array}{cccc|c} 1 & 0 & 1 & 1 & 4 \\ 0 & 1 & 1 & -1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

$\Rightarrow$

$x_1 + x_3 + x_4 = 4$ $\quad x_1 = 4 - x_3 - x_4$

$x_2 + x_3 - x_4 = 1$ $\quad x_2 = 1 - x_3 + x_4$

$x_3 = \text{free}$ $\quad x_3 = x_3$

$x_4 = \text{free}$ $\quad x_4 = x_4$

$$\underline{x} = \begin{bmatrix} 4 \\ 1 \\ 0 \\ 0 \end{bmatrix} + x_3 \begin{bmatrix} -1 \\ -1 \\ 1 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} -1 \\ 1 \\ 0 \\ 1 \end{bmatrix}$$

b)

$$\begin{bmatrix} 1 & A \\ -1 & C \end{bmatrix}\begin{bmatrix} 1 & A \\ -1 & C \end{bmatrix} = 0$$

$$\begin{bmatrix} 1-A & A+AC \\ -1-C & -A+C^2 \end{bmatrix} \Rightarrow \quad 1-A=0 \quad A=1 \qquad -1-C=0 \quad C=-1$$

$A(1+C)=0$ $\quad A(1-1)=0$ $\quad 0=0$ ✓

$-A+C^2=0$ $\quad -(1)+(-1)^2=0$ $\quad 0=0$ ✓

$$B = \begin{bmatrix} 1 & 1 \\ -1 & -1 \end{bmatrix}$$

A21