Math 49B (8:30am – 9:20am)
Quiz 8 Version A
Fri Mar 11, 2011

What month is your birthday ? ___
What are the first 2 digits of your address ? ___
What are the last 2 digits of your zip code ? ___
What are the last 2 digits of your DeAnza ID number ? ___

SCORE: ___ / 30 POINTS

NO MATRIX-CAPABLE CALCULATORS ALLOWED
YOU MUST SHOW APPROPRIATE WORK TO RECEIVE FULL CREDIT
NO CREDIT FOR GUESS & CHECK

Suppose $A = BC$, where A has 2 columns, and B has 5 rows, and C has 4 rows. **SCORE: ___ / 3 POINTS**

[a] What is the order of A ? 5×2

[b] What is the order of B ? 5×4

[c] What is the order of C ? 4×2

$A = B\ C$
$5\times 2 \quad 5\times 4 \quad 4\times 2$

Let $A = \begin{bmatrix} 2 & -3 \\ -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & -1 \\ 3 & 2 \end{bmatrix}$. **SCORE: ___ / 7 POINTS**

[a] Solve for X in the equation $3A - 2X = B$. (You must find all entries of X.)

$X = -\frac{1}{2}(B - 3A)$

$$X = -\frac{1}{2}\left(\begin{bmatrix} -4 & -1 \\ 3 & 2 \end{bmatrix} - 3\begin{bmatrix} 2 & -3 \\ -1 & 4 \end{bmatrix}\right) = -\frac{1}{2}\left(\begin{bmatrix} -4 & -1 \\ 3 & 2 \end{bmatrix} - \begin{bmatrix} 6 & -9 \\ -3 & 12 \end{bmatrix}\right) = -\frac{1}{2}\begin{bmatrix} -10 & 8 \\ 6 & -10 \end{bmatrix}$$

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

[b] Find BA.

$$\begin{bmatrix} -4 & -1 \\ 3 & 2 \end{bmatrix}\begin{bmatrix} 2 & -3 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} -8+1 & 12-4 \\ 6-2 & -9+8 \end{bmatrix} = \begin{bmatrix} -7 & 8 \\ 4 & -1 \end{bmatrix}$$

[c] Find A^2.

$$\begin{bmatrix} 2 & -3 \\ -1 & 4 \end{bmatrix}\begin{bmatrix} 2 & -3 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} 4+3 & -6-12 \\ -2-4 & 3+16 \end{bmatrix} = \begin{bmatrix} 7 & -18 \\ -6 & 19 \end{bmatrix}$$

Write, **BUT DO NOT SOLVE,** an augmented matrix for the following problem. **SCORE: ___ / 4 POINTS**

You need to create a blend of plant food that contains 20 kg of nitrogen, 30 kg of phosphorus, and 25 kg of potassium.
Each bag of Brand A contains 2 kg of nitrogen, 4 kg of phosphorus and 3 kg of potassium.
Each bag of Brand B contains 1 kg of phosphorus and 6 kg of potassium.
Each bag of Brand C contains 4 kg of nitrogen and 3 kg of potassium.
Is it possible to create your desired blend using only a mixture of brands A, B and C ?

IF x = # BAGS OF BRAND A
y = B
z = C

NITROGEN: $2x + 4z = 20$
PHOSPHORUS: $4x + y = 30$
POTASSIUM: $3x + 6y + 3z = 25$

$$\left[\begin{array}{ccc|c} 2 & 0 & 4 & 20 \\ 4 & 1 & 0 & 30 \\ 3 & 6 & 3 & 25 \end{array}\right]$$

If $\begin{vmatrix} x & 2 \\ 3 & -4 \end{vmatrix} = 11$, find x.

SCORE: ___ / 3 POINTS

$-4x-6=11$

$-4x=17$

$x=-\frac{17}{4}$

Write the **form** of the partial fraction decomposition of $\frac{1}{x^4+4x^2}$.

SCORE: ___ / 3 POINTS

DO NOT SOLVE FOR THE CONSTANTS.

$$\frac{1}{x^4+4x^2} = \frac{1}{x^2(x^2+4)} = \frac{A}{x} + \frac{B}{x^2} + \frac{Cx+D}{x^2+4}$$

Find $\begin{vmatrix} 2 & -1 & 0 & 3 \\ -2 & -3 & 1 & 0 \\ 0 & 1 & 2 & -3 \\ -1 & -2 & 0 & 3 \end{vmatrix}$.

SCORE: ___ / 5 POINTS

$$= -1\begin{vmatrix} 2 & -1 & 3 \\ 0 & 1 & -3 \\ -1 & -2 & 3 \end{vmatrix} + 2\begin{vmatrix} 2 & -1 & 3 \\ -2 & -3 & 0 \\ -1 & -2 & 3 \end{vmatrix}$$

$$= -1(-6) + 2(-21)$$

$$= -36$$

$\begin{vmatrix} 2 & -1 & 3 \\ 0 & 1 & -3 \\ -1 & -2 & 3 \end{vmatrix}\begin{matrix} 2 & -1 \\ 0 & 1 \\ -1 & -2 \end{matrix}$

$= 6-3+0+3-12-0$

$= -6$

$\begin{vmatrix} 2 & -1 & 3 \\ -2 & -3 & 0 \\ -1 & -2 & 3 \end{vmatrix}\begin{matrix} 2 & -1 \\ -2 & -3 \\ -1 & -2 \end{matrix}$

$= -18+0+12-9-0-6$

$= -21$

Find the **reduced** row echelon form of $\begin{bmatrix} 0 & 1 & 2 & 0 & -1 \\ 2 & 3 & 0 & 5 & -1 \\ 1 & 2 & 1 & 2 & 0 \end{bmatrix}$. $R_1 \leftrightarrow R_3$

SCORE: ___ / 5 POINTS

$\begin{bmatrix} 1 & 2 & 1 & 2 & 0 \\ 2 & 3 & 0 & 5 & -1 \\ 0 & 1 & 2 & 0 & -1 \end{bmatrix} R_2+(-2)R_1$

$\downarrow$

$\begin{bmatrix} 1 & 2 & 1 & 2 & 0 \\ 0 & -1 & -2 & 1 & -1 \\ 0 & 1 & 2 & 0 & -1 \end{bmatrix} R_2 \leftrightarrow R_3$

$\downarrow$

$\begin{bmatrix} 1 & 2 & 1 & 2 & 0 \\ 0 & 1 & 2 & 0 & -1 \\ 0 & -1 & -2 & 1 & -1 \end{bmatrix} R_3+R_2 \to R_3$

$\begin{bmatrix} 1 & 2 & 1 & 2 & 0 \\ 0 & 1 & 2 & 0 & -1 \\ 0 & 0 & 0 & 1 & -2 \end{bmatrix} R_1+(-2)R_3 \to R_1$

$\downarrow$

$\begin{bmatrix} 1 & 2 & 1 & 0 & 4 \\ 0 & 1 & 2 & 0 & -1 \\ 0 & 0 & 0 & 1 & -2 \end{bmatrix} R_1+(-2)R_2 \to R_1$

$\downarrow$

$\begin{bmatrix} 1 & 0 & -3 & 0 & 6 \\ 0 & 1 & 2 & 0 & -1 \\ 0 & 0 & 0 & 1 & -2 \end{bmatrix}$