Math 49B (8:30am – 9:20am)
Quiz 6
Fri Nov 7, 2008

SCORE: ___ / 20 POINTS

What day of the month is your birthday ? ___ ___
What are the last 2 digits of your address ? ___ ___
What are the last 2 digits of your zip code ? ___ ___
What are the last 2 digits of your social security number ? ___ ___
[IF YOU DO NOT HAVE A SOCIAL SECURITY NUMBER, USE YOUR STUDENT ID NUMBER]

NO MATRIX CAPABLE CALCULATORS ALLOWED

Write an augmented matrix for the following problem. **You must state clearly what your unknowns represent.** **SCORE: ___ / 5 POINTS**

DO NOT SOLVE THE SYSTEM OF EQUATIONS.

A life insurance company advertises on television, radio and in the local newspaper. The marketing department has an advertising budget of \$27,100 per month. A television ad costs \$1,500, a radio ad costs \$200, and a newpaper ad costs \$400. The department wants to run 50 ads per month, and have three times as many newspaper ads as television ads. How many of each type of ad can the department run each month ?

t = # TV ADS
r = # RADIO ADS
n = # NEWSPAPER ADS

$t + r + n = 50$ ½
$1500t + 200r + 400n = 27100$ ½
$n = 3t \Rightarrow 3t - n = 0$ ½

$$\left[\begin{array}{cccc} 1 & 1 & 1 & 50 \\ 1500 & 200 & 400 & 27100 \\ 3 & 0 & -1 & 0 \end{array}\right]$$

THE COLUMNS CAN BE IN ANY ORDER

½ POINT IF 1 CORRECT ROW
1½ 2
2½ 3

2 × 3 1 × 3 3 × 3

Let $A = \begin{bmatrix} 2 & -1 & 3 \\ -4 & 3 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 7 & 2 & -3 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 3 & -1 \\ -2 & -4 & 5 \\ 1 & 4 & 2 \end{bmatrix}$.

SCORE: ___ / 4 POINTS

Only one of the products BA, CB or AC exist. Find the product that exists, find its value and its order.

AC (2×3 · 3×3) = $\begin{bmatrix} 5 & 22 & -1 \\ -5 & -20 & 21 \end{bmatrix}$

2 × 3

½ POINT EACH (MUST BE IN CORRECT POSITION)

QUESTIONS ON OTHER SIDE

Solve for X in the equation $3X + 2\underbrace{\begin{bmatrix} 7 & -1 & 0 \\ -5 & 2 & 3 \end{bmatrix}}_{A} = \underbrace{\begin{bmatrix} -1 & 1 & 6 \\ -4 & 7 & 0 \end{bmatrix}}_{B}$

SCORE: ___ / 4 POINTS

$3X + 2A = B$

$3X = -2A + B$

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

$= \frac{1}{3}\left(-2\begin{bmatrix} 7 & -1 & 0 \\ -5 & 2 & 3 \end{bmatrix} + \begin{bmatrix} -1 & 1 & 6 \\ -4 & 7 & 0 \end{bmatrix}\right)$

$= \frac{1}{3}\left(\begin{bmatrix} -14 & 2 & 0 \\ 10 & -4 & -6 \end{bmatrix} + \begin{bmatrix} -1 & 1 & 6 \\ -4 & 7 & 0 \end{bmatrix}\right)$

$= \frac{1}{3}\begin{bmatrix} -15 & 3 & 6 \\ 6 & 3 & -6 \end{bmatrix}$

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

$\frac{1}{2}$ POINT EACH
(MUST BE IN CORRECT POSITION)

Use **Gauss-Jordan elimination** to solve the system

$$\begin{aligned} 2x - 5y + 5z &= 17 \\ x - 2y + 3z &= 9 \\ -x + 3y &= -4 \end{aligned}$$

SCORE: ___ / 7 POINTS

SUBTRACT THE POINTS LISTED HERE →

Show and label all row operations performed as shown in class. Check your final answer.

$\left[\begin{array}{ccc|c} 2 & -5 & 5 & 17 \\ 1 & -2 & 3 & 9 \\ -1 & 3 & 0 & -4 \end{array}\right]$ $R_1 \leftrightarrow R_2$ $\frac{1}{2}$

$\downarrow$

$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 2 & -5 & 5 & 17 \\ -1 & 3 & 0 & -4 \end{array}\right]$ $R_2 + (-2)R_1$, $R_3 + (1)R_1$

$\downarrow$

$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & -1 & -1 & -1 \\ 0 & 1 & 3 & 5 \end{array}\right]$ $R_2 * (-1)$

$\downarrow$

$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 1 & 1 \\ 0 & 1 & 3 & 5 \end{array}\right]$ $R_3 + (-1)R_2$

$\downarrow$

$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 2 & 4 \end{array}\right]$ $R_3 * (\frac{1}{2})$

$\downarrow$

$\left[\begin{array}{ccc|c} 1 & -2 & 3 & 9 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 2 \end{array}\right]$ $R_1 + (-3)R_3$, $R_2 + (-1)R_3$

$\downarrow$

$\left[\begin{array}{ccc|c} 1 & -2 & 0 & 3 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{array}\right]$ $R_1 + (2)R_2$

$\downarrow$

RREF

$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{array}\right]$

$1\frac{1}{2}$

$x = 1$
$y = -1$
$z = 2$

OR

$(1, -1, 2)$

USE YOUR CALCULATOR'S RREF FEATURE TO FIND THE RREF OF EACH MATRIX YOU GENERATED; 1 POINT FOR EACH MATRIX WHOSE RREF MATCHES (NOT INCLUDING THE FIRST AUGMENTED MATRIX) UP TO 4 POINTS

CHECK:

$2(1) - 5(-1) + 5(2) = 17$ ✓
$(1) - 2(-1) + 3(2) = 9$ ✓
$-(1) + 3(-1) = -4$ ✓

1 POINT IF YOU CHECKED WITH CORRECT x, y, z
OR IF YOU CHECKED WITH WRONG X, y, z AND FOUND AN ERROR

0 POINTS IF YOU CHECKED WITH WRONG X, y, z AND DIDN'T FIND AN ERROR