Multiple-Choice Test

Chapter 4.05
System of Equations

1. A 3×4 matrix can have a rank of at most
   (A) 3
   (B) 4
   (C) 5
   (D) 12

2. Three kids – Jim, Corey and David receive an inheritance of $2,253,453. The money is put in three trusts but is not divided equally to begin with. Corey gets three times what David gets because Corey made an "A" in Dr. Kaw's class. Each trust is put in an interest generating investment. The three trusts of Jim, Corey and David pay an interest of 6%, 8%, 11%, respectively. The total interest of all the three trusts combined at the end of the first year is $190,740.57. How much money was invested in each trust? The equations in a matrix form are
   (A) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 3 \\ .06 & .08 & .11 \end{bmatrix}\begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2253543 \\ 0 \\ 190740.57 \end{bmatrix}$
   (B) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & -3 \\ .06 & .08 & .11 \end{bmatrix}\begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2253543 \\ 0 \\ 190740.57 \end{bmatrix}$
   (C) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & -3 \\ 6 & 8 & 11 \end{bmatrix}\begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2253543 \\ 0 \\ 190740.57 \end{bmatrix}$
   (D) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & -3 \\ .06 & .08 & .11 \end{bmatrix}\begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2253543 \\ 0 \\ 190740.57 \end{bmatrix}$

3. Which of the following matrices does not have an inverse

(A) $\begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$

(B) $\begin{bmatrix} 6 & 7 \\ 12 & 14 \end{bmatrix}$

(C) $\begin{bmatrix} 6 & 0 \\ 0 & 7 \end{bmatrix}$

(D) $\begin{bmatrix} 0 & 6 \\ 7 & 0 \end{bmatrix}$

4. The set of equations

$$\begin{bmatrix} 1 & 2 & 5 \\ 2 & 3 & 7 \\ 5 & 8 & 19 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 18 \\ 26 \\ 70 \end{bmatrix}$$

has

(A) no solution
(B) finite number of solutions
(C) a unique solution
(D) infinite solutions

5. Given a system of $[A][X]=[C]$ where $[A]$ is $n \times n$ matrix and $[X]$ and $[C]$ are $n \times 1$ matrices, a unique solution $[X]$ exists if

(A) rank of $[A] =$ rank of $[A \vdots C]$
(B) rank of $[A] =$ rank of $[A \vdots C] = n$
(C) rank of $[A] <$ rank of $[A \vdots C]$
(D) rank of $[A] =$ rank of $[A \vdots C] < n$

6. If $[A][X]=\begin{bmatrix}-13\\76\\38\end{bmatrix}$ and

$$[A]^{-1}=\begin{bmatrix}1 & 2 & -4\\-8 & 2 & 16\\2 & 4 & 8\end{bmatrix}$$

then

(A) $[X]=\begin{bmatrix}-13.000\\864.00\\582.00\end{bmatrix}$

(B) one cannot find a unique $[X]$.

(C) $[X]=\begin{bmatrix}-1.0000\\2.0000\\4.0000\end{bmatrix}$

(D) no solutions of $[X]$ are possible