Holistic Numerical Methods Institute
committed to bringing numerical methods to undergraduates

Multiple Choice Test

Background of Simultaneous Linear Equations

1. Given $[A] = \begin{bmatrix} 6 & 2 & 3 & 9 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 4 & 5 \\ 0 & 0 & 0 & 6 \end{bmatrix}$ then [A] is a ______________ matrix.

(A) diagonal
(B) identity
(C) lower triangular
(D) upper triangular

2. A square matrix [A] is lower triangular if

(A) $a_{ij} = 0, j > i$
(B) $a_{ij} = 0, i > j$
(C) $a_{ij} \neq 0, i > j$
(D) $a_{ij} \neq 0, j > i$

3. Given

$$[A] = \begin{bmatrix} 12.3 & -12.3 & 20.3 \\ 11.3 & -10.3 & -11.3 \\ 10.3 & -11.3 & -12.3 \end{bmatrix}, \quad [B] = \begin{bmatrix} 2 & 4 \\ -5 & 6 \\ 11 & -20 \end{bmatrix}$$

then if
[C] = [A] [B], then
c_{31}= ______________________

(A) -58.2
(B) -37.6
(C) 219.4
(D) 259.4

4. The following system of equations has ____________ solution(s).

$$x + y = 2$$
$$6x+6y = 12$$

(A) infinite
(B) no
(C) two
(D) unique

5. Consider there are only two computer companies in a country. The companies are named *Dude* and *Imac*. Each year, company *Dude* keeps $1/5^{th}$ of its customers, while the rest switch to *Imac*. Each year, *Imac* keeps $1/3^{rd}$ of its customers, while the rest switch to *Dude*. If in *2003*, *Dude* had $1/6^{th}$ of the market and *Imac* had $5/6^{th}$ of the market, what will be share of *Dude* computers when the market becomes stable?

(A) 37/90
(B) 5/11
(C) 6/11
(D) 53/90

6. 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's trust is three times that of David's 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 pays 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. The equations to find the trust money of Jim (*J*), Corey (*C*) and David (*D*) in a matrix form is

(A) $$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 3 & -1 \\ 0.06 & 0.08 & 0.11 \end{bmatrix} \begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2,253,453 \\ 0 \\ 190,740.57 \end{bmatrix}$$

(B) $$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & -3 \\ 0.06 & 0.08 & 0.11 \end{bmatrix} \begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2,253,453 \\ 0 \\ 190,740.57 \end{bmatrix}$$

(C) $$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & -3 \\ 6 & 8 & 11 \end{bmatrix} \begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2,253,453 \\ 0 \\ 190,740.57 \end{bmatrix}$$

(D) $$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 3 & -1 \\ 6 & 8 & 11 \end{bmatrix} \begin{bmatrix} J \\ C \\ D \end{bmatrix} = \begin{bmatrix} 2,253,453 \\ 0 \\ 19,074,057 \end{bmatrix}$$