Continuing Education Course #286
Engineering Methods in Microsoft Excel
Part 1: Linear Algebra

1. An array is
- a. a list of data and the mathematical relationships used to describe it
- b. an ordered list or arrangement, of data
- c. a system of methods used to analyze a list of data

2. The dimensions of an array denote
- a. the amount of computer resources needed to manipulate the array
- b. the number of rows and columns used to arrange the elements of the array
- c. which functions can be performed on the elements of the array

Use the following arrays to answer Question 3 through Question 17.

$$A = \begin{bmatrix} 2 & 0 & 1 & -1 & 3 & -1 \\ 3 & 0 & -1 & 4 & 1 & 2 \\ -1 & 3 & -2 & 2 & 1 & -3 \\ -2 & 2 & 1 & 5 & 2 & 4 \\ 2 & 4 & -2 & 1 & 5 & -5 \\ 1 & 9 & 3 & -3 & 3 & 6 \end{bmatrix}$$

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

3. A + B is equal to
- a.

$$\begin{bmatrix} 4 & 1 & 0 & 0 & 0 & -1 \\ 6 & 2 & 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 & 0 & 4 \\ 1 & 1 & 1 & 2 & 1 & 3 \\ 1 & 1 & -2 & 0 & 2 & 1 \\ 1 & 1 & 3 & -3 & 1 & 2 \end{bmatrix}$$

- b.

$$\begin{bmatrix} 4 & 1 & 3 & 1 & 1 & 1 \\ 6 & 2 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 2 & 1 & 3 \\ 0 & 0 & 0 & 0 & 2 & 1 \\ 4 & 2 & 3 & -3 & 1 & 2 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 4 & 1 & 4 & 3 & 4 & -2 \\ 6 & 2 & 0 & 7 & 5 & 3 \\ 2 & 6 & 0 & 3 & 4 & 1 \\ 1 & 4 & 2 & 7 & 3 & 7 \\ 4 & 3 & -4 & 1 & 7 & -4 \\ 5 & 11 & 6 & -6 & 4 & 8 \end{bmatrix}$$

4. A - B is equal to

○ a.

$$\begin{bmatrix} 0 & -1 & -2 & -5 & 2 & 0 \\ 0 & -2 & -2 & 1 & -3 & 1 \\ -4 & 0 & -4 & 1 & -2 & -7 \\ -5 & 0 & 0 & 3 & 1 & 1 \\ 0 & 5 & 0 & 1 & 3 & -6 \\ -3 & 7 & 0 & 0 & 2 & 4 \end{bmatrix}$$

○ b.

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

○ c.

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

5. 17*A is equal to

○ a.

$$\begin{bmatrix} 34 & 0 & 17 & 17 & 0 & 17 \\ 51 & 0 & -17 & 0 & 17 & 0 \\ -17 & 51 & -34 & 17 & 0 & 17 \\ -34 & 34 & 17 & 0 & 17 & 0 \\ 34 & 68 & -34 & 17 & 0 & 17 \\ 17 & 153 & 51 & 0 & 17 & 0 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 34 & 0 & 17 & -17 & 51 & -17 \\ 51 & 0 & -17 & 68 & 17 & 34 \\ -17 & 51 & -34 & 34 & 17 & -51 \\ -34 & 34 & 17 & 85 & 34 & 68 \\ 34 & 68 & -34 & 17 & 85 & -85 \\ 17 & 153 & 51 & -51 & 51 & 102 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 34 & 0 & 17 & -17 & 51 & -17 \\ 51 & 0 & -17 & 0 & 0 & 0 \\ -17 & 51 & -34 & 0 & 17 & 0 \\ 0 & 0 & 17 & 0 & 0 & 0 \\ 0 & 0 & 0 & 17 & 0 & 0 \\ 17 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

6. The transpose of B is equal to

○ a.

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

○ b.

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

○ c.

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

7. Multiplying a scalar value of 22 by the transpose of A yields

○ a.

$$\begin{bmatrix} -44 & -66 & -22 & -44 & 44 & 22 \\ 0 & 0 & 66 & 44 & 88 & 198 \\ -22 & -22 & -44 & 22 & 44 & -66 \\ -22 & -88 & 44 & 110 & -22 & 66 \\ -66 & -22 & 22 & 44 & 110 & 66 \\ -22 & -44 & -66 & 88 & 110 & -132 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 44 & 66 & -22 & 22 & 22 & 22 \\ 0 & 0 & 66 & 22 & 22 & 22 \\ 22 & -22 & -44 & 22 & 22 & 22 \\ 22 & 22 & 22 & 110 & 22 & -66 \\ 22 & 22 & 22 & 44 & -22 & -22 \\ 22 & 22 & 22 & 88 & -22 & -22 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 44 & 66 & -22 & -44 & 44 & 22 \\ 0 & 0 & 66 & 44 & 88 & 198 \\ 22 & -22 & -44 & 22 & -44 & 66 \\ -22 & 88 & 44 & 110 & 22 & -66 \\ 66 & 22 & 22 & 44 & 110 & 66 \\ -22 & 44 & -66 & 88 & -110 & 132 \end{bmatrix}$$

8. Two matrices can be multiplied if

- a. the dimensions of the two matrices are the same
- b. the outer dimension of the first matrix equals the inner dimension of the second matrix
- c. the inner dimensions of the two matrices are equal

9. The matrix multiplication of A*B yields

a.

$$\begin{bmatrix} 6 & -2 & -2 & -4 & 3 & 1 \\ 25 & 11 & 15 & 12 & 4 & 2 \\ -3 & -4 & -13 & 2 & 3 & -12 \\ 40 & 21 & 11 & 10 & 2 & 12 \\ 3 & -9 & -18 & 0 & 10 & -5 \\ 59 & 31 & 27 & 9 & 3 & 12 \end{bmatrix}$$

b.

$$\begin{bmatrix} 4 & 0 & 3 & -4 & 3 & 1 \\ 9 & 0 & -1 & 12 & 4 & 2 \\ -3 & 9 & -4 & 2 & 3 & -12 \\ -6 & 4 & 1 & 10 & 2 & 12 \\ 4 & -4 & 4 & 0 & 10 & -5 \\ 4 & 18 & 9 & 9 & 3 & 12 \end{bmatrix}$$

c.

$$\begin{bmatrix} 6 & -2 & -2 & 10 & 9 & 0 \\ 25 & 11 & 15 & 13 & 8 & 10 \\ -3 & -4 & -13 & 16 & 6 & -3 \\ 40 & 21 & 11 & -3 & 22 & 33 \\ 3 & -9 & -18 & 35 & 18 & -8 \\ 59 & 31 & 27 & 10 & 55 & 26 \end{bmatrix}$$

10. The matrix multiplication of B*B yields

a.

$$\begin{bmatrix} 26 & 18 & 12 & 25 & 20 & 22 \\ 36 & 14 & 11 & 22 & 26 & 18 \\ 46 & 22 & 23 & 13 & 32 & 22 \\ 35 & 19 & 22 & 14 & 21 & 16 \\ 3 & -6 & 0 & 0 & -3 & -7 \\ 24 & 14 & 21 & 13 & 22 & 6 \end{bmatrix}$$

b.

$$\begin{bmatrix} 4 & 1 & 9 & 16 & 1 & 1 \\ 9 & 4 & 1 & 9 & 16 & 1 \\ 9 & 9 & 4 & 1 & 9 & 16 \\ 9 & 4 & 1 & 4 & 1 & 9 \\ 4 & 1 & 4 & 0 & 4 & 1 \\ 16 & 4 & 9 & 9 & 1 & 4 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 26 & 18 & 12 & 16 & 1 & 1 \\ 36 & 14 & 11 & 9 & 16 & 1 \\ 46 & 22 & 23 & 1 & 9 & 16 \\ 35 & 19 & 22 & 4 & 1 & 9 \\ 3 & -6 & 0 & 0 & 4 & 1 \\ 24 & 14 & 21 & 9 & 1 & 4 \end{bmatrix}$$

11. The matrix multiplication of A and the transpose of B yields

○ a.

$$\begin{bmatrix} 7 & 15 & 12 & 5 & 7 & 15 \\ 18 & 26 & 22 & 23 & 12 & 2 \\ 7 & 8 & -5 & -3 & -2 & -15 \\ 19 & 26 & 29 & 23 & 0 & -6 \\ 16 & 30 & 10 & 4 & 9 & 2 \\ 5 & 33 & 66 & 39 & -1 & 55 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 7 & 15 & 12 & 5 & 9 & 0 \\ 18 & 26 & 22 & 23 & 8 & 10 \\ 7 & 8 & -5 & -3 & 6 & -3 \\ 19 & 26 & 29 & 23 & 22 & 33 \\ 16 & 30 & 10 & 4 & 18 & -8 \\ 5 & 33 & 66 & 39 & 55 & 26 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 6 & -2 & -2 & 10 & 9 & 0 \\ 25 & 11 & 15 & 13 & 8 & 10 \\ -3 & -4 & -13 & 16 & 6 & -3 \\ 40 & 21 & 11 & -3 & 22 & 33 \\ 3 & -9 & -18 & 35 & 18 & -8 \\ 59 & 31 & 27 & 10 & 55 & 26 \end{bmatrix}$$

12. The element-by-element multiplication of A .* B yields

○ a.

$$\begin{bmatrix} 6 & -2 & -2 & -4 & 3 & 1 \\ 25 & 11 & 15 & 12 & 4 & 2 \\ -3 & -4 & -13 & 2 & 3 & -12 \\ 40 & 21 & 11 & 10 & 2 & 12 \\ 3 & -9 & -18 & 0 & 10 & -5 \\ 59 & 31 & 27 & 9 & 3 & 12 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 4 & 0 & 3 & -4 & 3 & 1 \\ 9 & 0 & -1 & 12 & 4 & 2 \\ -3 & 9 & -4 & 2 & 3 & -12 \\ -6 & 4 & 1 & 10 & 2 & 12 \\ 4 & -4 & 4 & 0 & 10 & -5 \\ 4 & 18 & 9 & 9 & 3 & 12 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 6 & -2 & -2 & 10 & 9 & 0 \\ 25 & 11 & 15 & 13 & 8 & 10 \\ -3 & -4 & -13 & 16 & 6 & -3 \\ 40 & 21 & 11 & -3 & 22 & 33 \\ 3 & -9 & -18 & 35 & 18 & -8 \\ 59 & 31 & 27 & 10 & 55 & 26 \end{bmatrix}$$

13. The element-by-element multiplication of A .* A yields

○ a.

$$\begin{bmatrix} 4 & 0 & 1 & 1 & 9 & 1 \\ 9 & 0 & 1 & 16 & 1 & 4 \\ 1 & 9 & 4 & 4 & 1 & 9 \\ 4 & 4 & 1 & 25 & 4 & 16 \\ 4 & 16 & 4 & 1 & 25 & 25 \\ 1 & 81 & 9 & 9 & 9 & 36 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} -4 & 0 & -1 & 1 & 9 & 1 \\ -9 & 0 & -1 & 16 & 1 & 4 \\ -1 & 9 & -4 & 4 & 1 & 9 \\ -4 & 4 & -1 & 25 & 4 & 16 \\ -4 & 16 & -4 & 1 & 25 & 25 \\ -1 & 81 & -9 & 9 & 9 & 36 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 6 & -2 & -2 & -4 & 3 & 1 \\ 25 & 11 & 15 & 12 & 4 & 2 \\ -3 & -4 & -13 & 2 & 3 & -12 \\ 40 & 21 & 11 & 10 & 2 & 12 \\ 3 & -9 & -18 & 0 & 10 & -5 \\ 59 & 31 & 27 & 9 & 3 & 12 \end{bmatrix}$$

14. The determinant of A is
○ a. 2793
○ b. 273
○ c. 23

15. The determinant of B is
○ a. 86
○ b. 886
○ c. 1886

16. The inverse of the matrix A is
○ a.

$$\begin{bmatrix} -0.021 & 0.128 & -0.376 & 0.307 & 0.077 & 0.178 \\ -0.559 & 0.744 & -0.581 & 0.472 & -0.632 & 0.120 \\ 0.400 & -0.429 & 0.476 & -0.404 & 0.149 & -0.007 \\ 0.124 & 0.054 & 0.018 & 0.117 & 0.029 & -0.138 \\ 0.063 & 0.045 & 0.318 & -0.431 & 0.142 & -0.052 \\ 0.157 & -0.459 & 0.486 & -0.088 & 0.228 & -0.147 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 0.623 & 0.295 & 0.646 & -0.232 & -0.506 & 0.061 \\ 0.424 & 0.106 & 0.672 & -0.124 & -0.422 & 0.102 \\ 2.168 & 0.261 & 2.221 & -0.256 & -1.752 & 0.095 \\ 0.789 & 0.211 & 0.947 & -0.053 & -0.684 & 0.000 \\ -0.873 & -0.250 & -1.233 & 0.284 & 0.952 & -0.075 \\ -0.993 & -0.109 & -1.136 & 0.184 & 0.776 & -0.007 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 0.623 & 0.295 & 0.646 & -0.232 & 0.077 & 0.178 \\ 0.424 & 0.106 & 0.672 & -0.124 & -0.632 & 0.120 \\ 2.168 & 0.261 & 2.221 & -0.256 & 0.149 & -0.007 \\ 0.789 & 0.211 & 0.947 & -0.053 & 0.029 & -0.138 \\ -0.873 & -0.250 & -1.233 & 0.284 & 0.142 & -0.052 \\ -0.993 & -0.109 & -1.136 & 0.184 & 0.228 & -0.147 \end{bmatrix}$$

17. The inverse of the matrix B is

○ a.

$$\begin{bmatrix} -0.021 & 0.128 & -0.376 & 0.307 & 0.077 & 0.178 \\ -0.559 & 0.744 & -0.581 & 0.472 & -0.632 & 0.120 \\ 0.400 & -0.429 & 0.476 & -0.404 & 0.149 & -0.007 \\ 0.124 & 0.054 & 0.018 & 0.117 & 0.029 & -0.138 \\ 0.063 & 0.045 & 0.318 & -0.431 & 0.142 & -0.052 \\ 0.157 & -0.459 & 0.486 & -0.088 & 0.228 & -0.147 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 0.623 & 0.295 & 0.646 & -0.232 & -0.506 & 0.061 \\ 0.424 & 0.106 & 0.672 & -0.124 & -0.422 & 0.102 \\ 2.168 & 0.261 & 2.221 & -0.256 & -1.752 & 0.095 \\ 0.789 & 0.211 & 0.947 & -0.053 & -0.684 & 0.000 \\ -0.873 & -0.250 & -1.233 & 0.284 & 0.952 & -0.075 \\ -0.993 & -0.109 & -1.136 & 0.184 & 0.776 & -0.007 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} -0.021 & 0.128 & 0.646 & -0.232 & -0.506 & 0.061 \\ -0.559 & 0.744 & 0.672 & -0.124 & -0.422 & 0.102 \\ 0.400 & -0.429 & 2.221 & -0.256 & -1.752 & 0.095 \\ 0.124 & 0.054 & 0.947 & -0.053 & -0.684 & 0.000 \\ 0.063 & 0.045 & -1.233 & 0.284 & 0.952 & -0.075 \\ 0.157 & -0.459 & -1.136 & 0.184 & 0.776 & -0.007 \end{bmatrix}$$

18. The transpose of the matrix of cofactors is called the

○ a. adjoint matrix
○ b. inverse matrix
○ c. matrix of minors

19. Which of the following is correct

○ a. The adjoint of a matrix multiplied by the determinant of the matrix yields the inverse matrix.
○ b. The transpose of a matrix multiplied by a scalar value of -1 yields the matrix of minors.
○ c. The transpose of the matrix of cofactors multiplied by the identity matrix yields the inverse matrix.

○ d. All of the above
○ e. None of the above

20. The 6x6 identity matrix is

○ a.

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Use the following to answer Question 21 and Question 22

Consider the following system of linear equations

$$\begin{aligned} 4x_4 &= 5 \\ 3x_3 &= 4 \\ 5x_1 + 6x_2 + 7x_3 + 8x_4 &= 9 \\ 4x_2 + 3x_3 + 2x_4 &= 1 \end{aligned}$$

21. The system of linear equations in matrix form is

○ a.

$$\begin{bmatrix} 0 & 0 & 0 & 4 \\ 0 & 0 & 3 & 0 \\ 5 & 6 & 7 & 8 \\ 0 & 4 & 3 & 2 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \\ 9 \\ 1 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 0 & 0 & 5 & 0 \\ 0 & 0 & 6 & 4 \\ 0 & 3 & 7 & 3 \\ 4 & 0 & 8 & 2 \end{bmatrix} \begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \end{bmatrix} = \begin{bmatrix} 5 \\ 4 \\ 9 \\ 1 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \end{bmatrix} = \begin{bmatrix} 0.583 \\ 4.000 \\ 1.333 \\ 1.000 \end{bmatrix}$$

22. The solution of the system of linear equations is

○ a.

$$\begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \end{bmatrix} = \begin{bmatrix} 0.417 \\ 4.000 \\ 1.333 \\ 1.000 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \end{bmatrix} = \begin{bmatrix} -0.417 \\ 1.375 \\ -1.333 \\ -1.250 \end{bmatrix}$$

○ c.

$$\begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \end{bmatrix} = \begin{bmatrix} -0.417 \\ -1.375 \\ 1.333 \\ 1.250 \end{bmatrix}$$

Use the following to answer Question 23 and Question 24

Consider the following system of linear equations

$$\begin{aligned} 2x_1 - 7x_2 + 3x_3 + 5\,x_4 - 7x_5 + 11x_6 + 8x_7 &= 114 \\ 5x_1 + 7x_2 - x_3 + 9x_4 - 6x_5 + 3x_6 - 5x_7 &= -11 \\ 13x_1 + 11x_2 + 8x_3 + 7x_4 + 4x_5 + 2x_6 + x_7 &= -25 \\ 12x_1 + x_2 + 6x_3 + 5x_4 + 9x_5 + 3x_6 + 11x_7 &= -37 \end{aligned}$$

$$x_1 - 4x_2 + 7x_3 - 3x_4 + 9x_5 - 2x_6 + 6x_7 = 4$$
$$4x_1 + x_2 - 6x_3 - 3x_4 + 8x_5 - 7x_6 - 4x_7 = -91$$
$$-7x_1 - 2x_2 + 5x_3 + x_4 + 9x_5 + 3x_6 - 4x_7 = -50$$

23. The vector of right-hand-side terms is

○ a.

$$\begin{bmatrix} 2 \\ 7 \\ 8 \\ 5 \\ 9 \\ -7 \\ -4 \end{bmatrix}$$

○ b.

$$\begin{bmatrix} 114 \\ -11 \\ -25 \\ -37 \\ 4 \\ -91 \\ -50 \end{bmatrix}$$

○ c. Either of the above.

24. The solution of the system of linear equations is

○ a. $\begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \\ x5 \\ x6 \\ x7 \end{bmatrix} = \begin{bmatrix} -5 \\ 7 \\ -8 \\ 6 \\ 9 \\ -2 \\ 3 \end{bmatrix}$

○ b. $\begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \\ x5 \\ x6 \\ x7 \end{bmatrix} = \begin{bmatrix} -3 \\ -2 \\ 9 \\ -8 \\ -7 \\ 6 \\ -5 \end{bmatrix}$

○ c. $\begin{bmatrix} x1 \\ x2 \\ x3 \\ x4 \\ x5 \\ x6 \\ x7 \end{bmatrix} = \begin{bmatrix} 5 \\ -7 \\ 8 \\ -6 \\ -9 \\ 2 \\ -3 \end{bmatrix}$

25. Systems of equations with more than 8 unknowns and 8 equations

○ a. cannot be solved by matrix methods

○ b. can be solved by matrix methods but cannot be solved in *Excel*

○ c. can be solved by matrix methods and can be rapidly solved in *Excel*