Linear Algebra Warmup

Math SPIRAL Tutorial

June 1, 2004

1. Let
$$\mathbf{u} = \begin{pmatrix} 1 \\ 3 \\ 5 \end{pmatrix} \mathbf{v} = \begin{pmatrix} 6 \\ 4 \\ 2 \end{pmatrix}$$
Find: **u** + **v**, **u** - **v**, 3**v** - 2**u**

2. Solve the system of equations using elementary row operations on the augmented matrix
$$\begin{aligned} 2x_1 + 6x_2 &= -6 \\ 5x_1 + 7x_2 &= 1 \end{aligned}$$

3. Solve the system of equations using elementary row operations on the augmented matrix
$$\begin{aligned} 2x_1 \qquad\quad -4x_3 &= -10 \\ x_2 \quad +3x_3 &= 2 \\ 3x_1 \quad +5x_2 \quad +8x_3 &= -6 \end{aligned}$$

4. Do the three lines $2x_1 + 3x_2 = -1, 6x_1 + 5x_2 = 0$ and $2x_1 - 5x_2 = 7$ have a common intersection point?

5. Find the general solution of the linear system whose augmented matrix is
$$\begin{pmatrix} 1 & -3 & -5 & 0 \\ 0 & 1 & 1 & 3 \end{pmatrix}$$

6. Row reduce the matrix in reduced echelon form and list the pivot columns
$$\begin{pmatrix} 1 & 3 & 5 & 7 \\ 2 & 4 & 6 & 8 \\ 3 & 5 & 7 & 9 \end{pmatrix}$$

7. Let
$$A = \begin{pmatrix} 1 & 3 \\ 0 & 4 \\ -2 & 1 \end{pmatrix} \quad , \quad B = \begin{pmatrix} 2 & 3 \\ 1 & -1 \end{pmatrix}$$
Find AB^T and $(AB)^T$.

8. Let
$$A = \begin{pmatrix} 5 & 1 \\ 3 & -2 \end{pmatrix} \quad , \quad B = \begin{pmatrix} 2 & 0 \\ 4 & 3 \end{pmatrix}$$
Verify that $AB \neq BA$.

9. Let
$$A = \begin{pmatrix} 0 & 1 & 2 \\ 1 & 0 & 3 \\ 4 & -3 & 8 \end{pmatrix} \quad , \quad B = \begin{pmatrix} -9/2 & -7 & -3/2 \\ -2 & 4 & -1 \\ 3/2 & -2 & 1/2 \end{pmatrix}$$
Verify that $A^{-1} = B$.

10. Let
$$A = \begin{pmatrix} 5 & 1 \\ 3 & -2 \end{pmatrix}$$
Find A^{-1}.