3, 5, 7, 9, 12, 13, 15, 14, 21, 23 ... Nathan

09/13/23

Homework 1.3

3. $u = \begin{bmatrix} -1 \\ 2 \end{bmatrix}$ $v = \begin{bmatrix} -3 \\ -1 \end{bmatrix}$

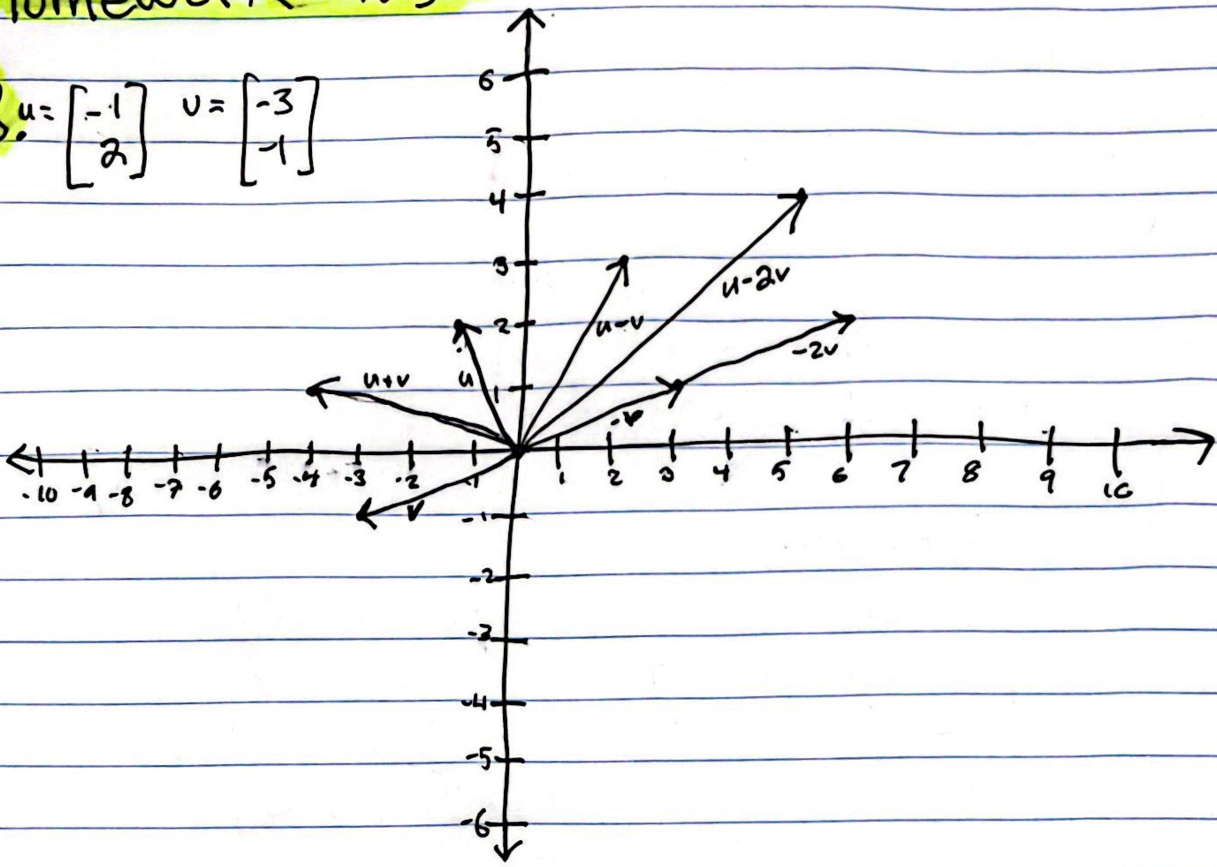
$-v = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$

$-2v = \begin{bmatrix} 6 \\ 2 \end{bmatrix}$

$u + v = \begin{bmatrix} -4 \\ 1 \end{bmatrix}$

$u - v = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$

$u - 2v = \begin{bmatrix} 5 \\ 4 \end{bmatrix}$



5.
$$6x_1 - 3x_2 = 1$$
$$-x_1 + 4x_2 = -7$$
$$5x_1 = -5$$

7.
$$a = u - 2v$$
$$b = 2u - 2v$$
$$c = 2u - 3.5v$$
$$d = 3u - 4v$$

9.
$$x_1 \begin{bmatrix} 0 \\ 4 \\ -1 \end{bmatrix} + x_2 \begin{bmatrix} 1 \\ 6 \\ 3 \end{bmatrix} + x_3 \begin{bmatrix} 5 \\ -1 \\ -8 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

12, 13, 15, 19

12. $x_1 + 2x_3 = -5$
$-2x_1 + 5x_2 = 11$
$2x_1 + 5x_2 + 8x_3 = -7$

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & -5 \\ -2 & 5 & 0 & 11 \\ 2 & 5 & 8 & -7 \end{array}\right]$$

$R_3 + R_2 \to R_2$

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & -5 \\ 0 & 10 & 8 & 4 \\ 2 & 5 & 8 & -7 \end{array}\right]$$

$-2R_1 + R_3 \to R_3$

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & -5 \\ 0 & 10 & 8 & 4 \\ 0 & 5 & 4 & 3 \end{array}\right]$$

$\frac{1}{2}R_2 \to R_2$

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & -5 \\ 0 & 5 & 4 & 2 \\ 0 & 5 & 4 & 3 \end{array}\right]$$

$-R_2 + R_3 \to R_3$

$$\left[\begin{array}{ccc|c} 1 & 0 & 2 & -5 \\ 0 & 5 & 4 & 2 \\ 0 & 0 & 0 & 1 \end{array}\right]$$

$b \neq$ linear combo

13.

$$\left[\begin{array}{ccc|c} 1 & -4 & 2 & 3 \\ 0 & 3 & 5 & -7 \\ -2 & 8 & -4 & -3 \end{array}\right]$$

$2R_1 + R_3 \to R_3$

$$\left[\begin{array}{ccc|c} 1 & -4 & 2 & 3 \\ 0 & 3 & 5 & -7 \\ 0 & 0 & 0 & 3 \end{array}\right]$$

$b \neq$ linear combo

15, 19, 24, a's

15. $\begin{bmatrix}0\\0\\0\end{bmatrix} = 0\vec{v}_1 + 0\vec{v}_2$

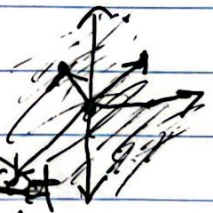
$0\vec{v}_1 + 2\begin{bmatrix}-5\\3\\0\end{bmatrix} = \begin{bmatrix}-10\\6\\0\end{bmatrix}$

$2\begin{bmatrix}7\\1\\-6\end{bmatrix} + 0\vec{v}_2 = \begin{bmatrix}14\\2\\-12\end{bmatrix}$

$0\vec{v}_1 + 3\begin{bmatrix}-5\\3\\0\end{bmatrix} = \begin{bmatrix}-15\\9\\0\end{bmatrix}$

$3\begin{bmatrix}7\\1\\-6\end{bmatrix} + 0\vec{v} = \begin{bmatrix}21\\3\\-18\end{bmatrix}$

19. Span $\{v_1, v_2\}$ is a plane (2d) that hits 0 and both v_1 and v_2



24. a. False, ~~vector is ordered~~ if list is unordered
True if list is ordered

b. True, $v+(u-v)$ is true because matrix addition is associative

c. False, the result would be a zero vector which is allowed

d. True, all linear vectors start at zero

24. cont

e. True, because b is a non pivot column

25. $\left[\begin{array}{ccc|c} 1 & 0 & -4 & 4 \\ 0 & 3 & -2 & 1 \\ -2 & 6 & 3 & -4 \end{array}\right] = [a_1\ a_2\ a_3\ b]$

$2R_1+R_3 \to R_3$

$\left[\begin{array}{ccc|c} 1 & 0 & -4 & 4 \\ 0 & 3 & -2 & 1 \\ 0 & 0 & -5 & 4 \end{array}\right]$ $-2R_2+R_3 \to R_3$ $\left[\begin{array}{ccc|c} 1 & 0 & -4 & 4 \\ 0 & 3 & -2 & 1 \\ 0 & 0 & -1 & 2 \end{array}\right]$ $-R_3 \to R_3$

$\left[\begin{array}{ccc|c} 1 & 0 & -4 & 4 \\ 0 & 3 & -2 & 1 \\ 0 & 0 & 1 & -2 \end{array}\right]$ = there is a solution = consistent

= this means b is in the span W

S.T. 1.3

~~8~~. A span is a set of all possible linear combos of given vectors