HW1 - MA232

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I pledge my honor that I have abided by the Stevens Honor System.

Problem 1

Red: W; Green: U; Purple: U+W; Blue: U-W

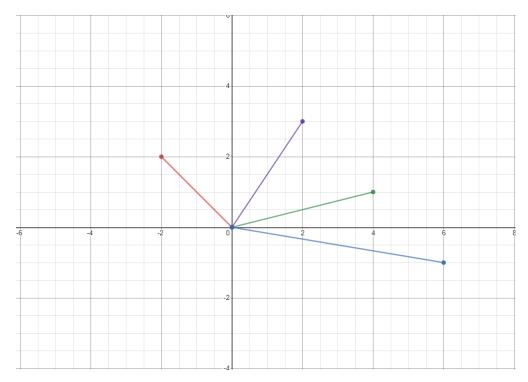


Figure 1: All the vectors

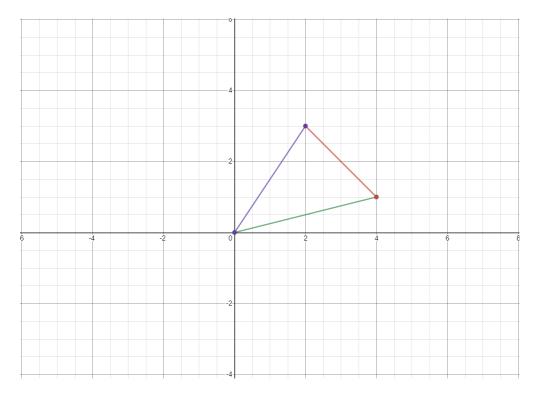


Figure 2: U+W

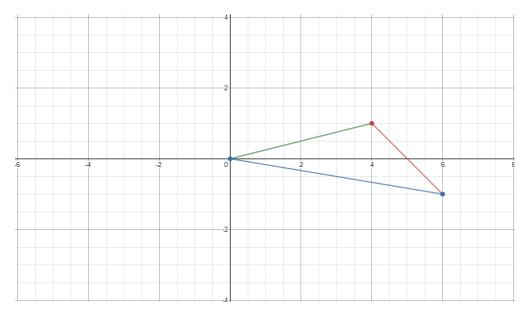


Figure 3: U-W

Problem 2

$$u + w = \begin{bmatrix} 4\\5\\6 \end{bmatrix}$$

$$u - w = \begin{bmatrix} 2 \\ 5 \\ 8 \end{bmatrix}$$

Add the two matrices together to get:

$$2u + w - w = \begin{bmatrix} 6\\10\\14 \end{bmatrix}$$

Or:

$$2u = \begin{bmatrix} 6\\10\\14 \end{bmatrix}$$

And:

$$u = \begin{bmatrix} 3 \\ 5 \\ 7 \end{bmatrix}$$

Therefore:

$$\begin{bmatrix} 3 \\ 5 \\ 7 \end{bmatrix} + w = \begin{bmatrix} 4 \\ 5 \\ 6 \end{bmatrix}$$

So:

$$w = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$$

Problem 3

If the dot product of the two vectors = 0, then the two vectors are perpendicular.

Original:

 $\left[\begin{array}{c}1\\0\\1\end{array}\right]$

U:

$$\left[\begin{array}{c} -1\\0\\1\end{array}\right]$$

W:

$$\left[\begin{array}{c} 0\\1\\0\end{array}\right]$$

Dot Product of Original & U: 1(-1) + 0(0) + 1(1) = 0

Dot Product of Original & W: 1(0) + 0(1) + 1(0) = 0

Dot Product of U & W: -1(0) + 0(1) + 1(0) = 0

Problem 4

$$\sqrt{1^2 + 1^2 + 1^2 + 1^2 + 1^2} = \sqrt{5}$$

Problem 5

$$\left[\begin{array}{ccc|c}
2 & 3 & 1 & 8 \\
4 & 7 & 5 & 20 \\
0 & -2 & 2 & 0
\end{array}\right]$$

$$R_2 - 2R_1$$

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

$$R_3 + 2R_2$$

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

$$R_{3}/8$$

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

$$R_2-3R_3$$

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

$$R_1 - 3R_2$$

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

$$R_1 - R_3$$

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

$$R_1/2$$

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

$$x=2;y=1;z=1$$