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

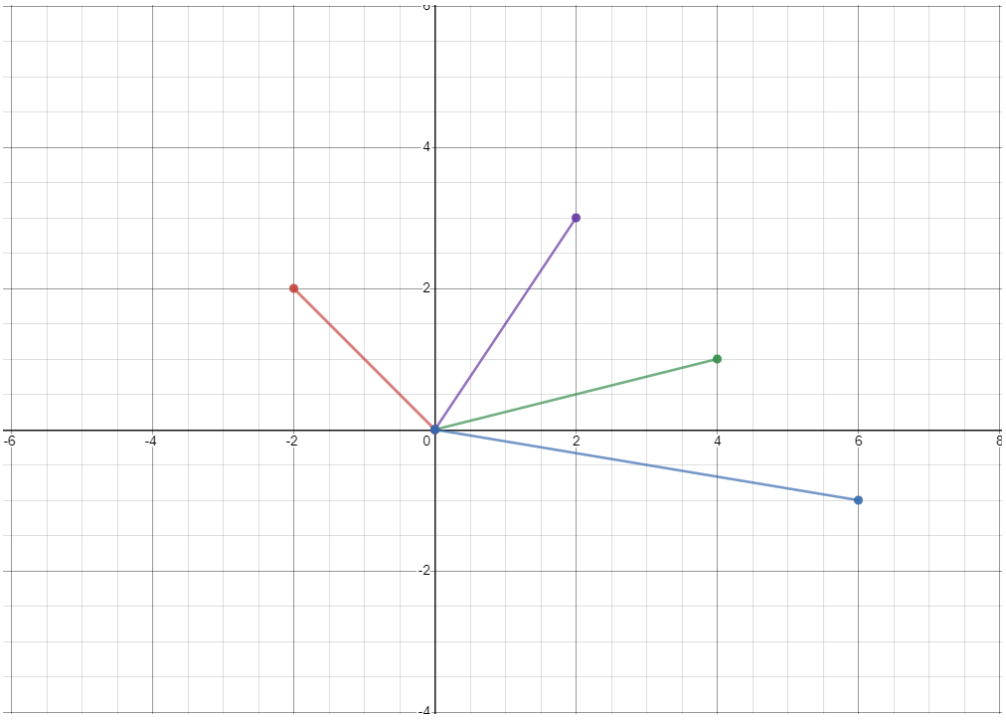

Figure 1: All the vectors

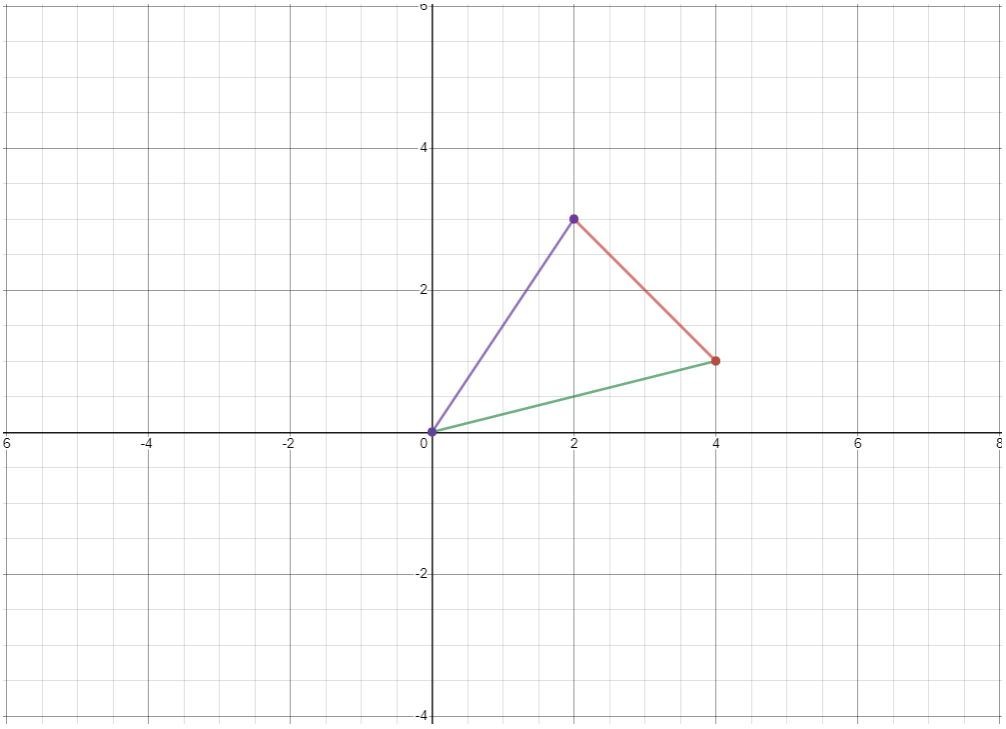

Figure 2: U+W

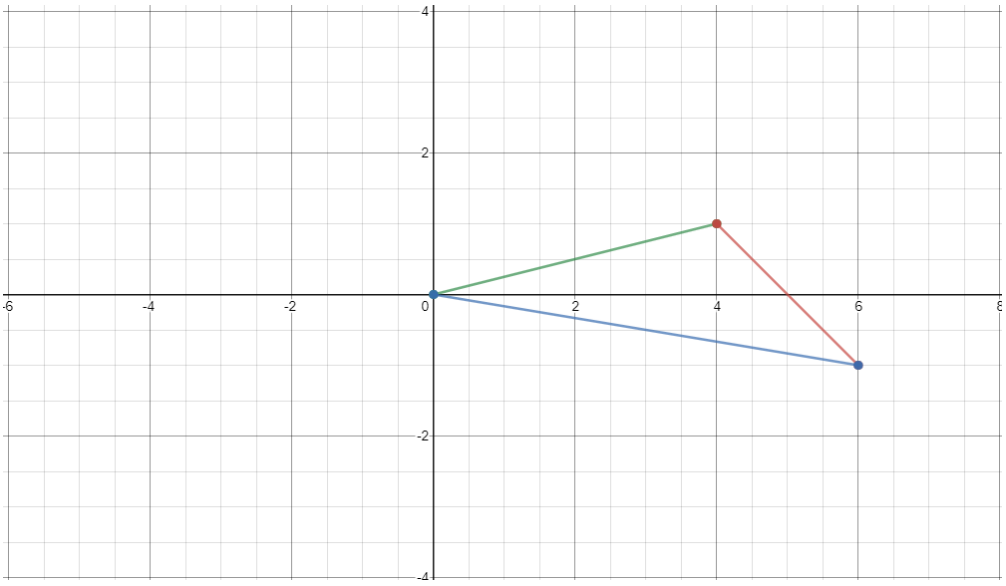

Figure 3: U-W

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:

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

U:

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

W:

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

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

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

$R_2 - 2R_1$

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

$R_3 + 2R_2$

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

$R_3/8$

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

$R_2 - 3R_3$

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

$R_1 - 3R_2$

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

$R_1 - R_3$

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

$R_1/2$

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

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