WORKSHEET: VECTOR OPERATIONS

Let $v = \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$, $w = \begin{bmatrix} 4 \\ 1 \\ -1 \end{bmatrix}$, $u = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$, $z = (2, 1)$.

1. On the same set of axes, draw u, z and $u + z$.

2. On the same set of axes, dray u, z and $u - z$.

3. Make the calculations below or explain why it is not defined.

(a) $v + u$

(b) $2v + w$

(c) $5 \mathbf{1}_4 - (u, u)$

(d) vw

(e) $v^T w$

(f) $w^T v$

(g) $(w^T v)u$

(h) $(w^T v) + u$

(i) $((w^T v), 1) + u$

4. Find y_3 and $y_{2:4}$ for $y = (2v, u)$. Recall $v = \begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$ and $u = \begin{bmatrix} 1 \\ 4 \end{bmatrix}$.

5. Suppose x is a vector of dimension 100 and $\mathbf{1} = \mathbf{1}_{100}$. Use words and symbols (such as x_i) to describe what each calculation below will do.

    (a) $\mathbf{1}^T x$

    (b) $\left(\frac{\mathbf{1}^T}{100} \right) x$

    (c) $\sqrt{x^T x}$

    (d) $(e_1 + e_2)^T x$

    (e) Construct a vector a such that $a^T x$ gives the average of the last 10 entries in x.