HOMEWORK #2

In all the problems, assume the scalars are real scalars unless the problem states otherwise.

Problem 1. Draw the following vectors in standard position in $\mathbb{R}^2$.

(a) $a = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$
(b) $b = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$
(c) $c = \begin{bmatrix} -2 \\ -1 \end{bmatrix}$

Problem 2. Solve for the vector $x$ in terms of the vectors $a$ and $b$.

(a) $x - a = 2(x - 3a + b)$
(b) $0 = a + \frac{1}{2}(x + \frac{1}{2}(x + b))$

Problem 3. Working with scalars in $\mathbb{Z}_3$ solve for the vector $x$ in terms of the vectors $a$ and $b$.

(a) $2x + a = a + b$
(b) $a - x = 2b + 2a$

Problem 4. Find the projection of $v$ onto $u$.

(a) $u = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \quad v = \begin{bmatrix} 0 \\ 3 \\ 3 \end{bmatrix}$
(b) $u = \begin{bmatrix} 1 \\ a \\ 0 \end{bmatrix}, \quad v = \begin{bmatrix} 0 \\ b \\ b \end{bmatrix}$

Problem 5. Prove that if $u$ is orthogonal to $v$ and to $w$ then it is orthogonal to $v - w$.

Problem 6. Find the vector equation of the plane passing through $P$, $Q$, and $R$ for

$P = (1, 1, 1), \quad Q = (2, 1, 2), \quad R = (3, 3, 3)$