Homework Set 2

Read sections 1.2, 2.1.

Section 1.2

1. (a) (BH) Find $c$ so that the vectors
\[
\begin{pmatrix} c \\ 4 \end{pmatrix} \quad \text{and} \quad \begin{pmatrix} 2 \\ 5 \end{pmatrix}
\]
are parallel.
(b) (MP) Calculate the angle between the two vectors for any $c$.

2. Show that for any nonzero constant $\alpha$, $\text{proj}_w v = \alpha \text{proj}_w v$.

3. (BH) Let
\[
v = \begin{pmatrix} 5 \\ 4 \end{pmatrix}, \quad w = \begin{pmatrix} 1 \\ -1 \end{pmatrix}.
\]
(a) Find $\text{proj}_w v$.
(b) Find the vector component of $v$ orthogonal to $w$.

4. (MP) Let $v = (-1, 3, 2, 0, 6)$, $w = (5, 3, 2, 1, 0)$.
(a) Find $\text{proj}_w v$.
(b) Find the vector component of $v$ orthogonal to $w$.

5. (BH) Consider the figure at right. Here $||w_1|| = ||w_2||$.
(a) Show that $v \cdot w_2 = -v \cdot w_1$.
(b) Prove that the angles at the base of an isosceles triangle are equal.

Section 2.1

6. (BH) page 63, exercise 16
7. (MP) page 63, exercise 18
8. (BH) page 63, exercise 40
9. (BH) Consider the following system:

\[ x - 3y = \lambda, \quad (2.1a) \]
\[ -2x + 6y = 5. \quad (2.1b) \]

For which value(s) of \( \lambda \) will (2.1) have
(a) more than one solution?
(b) exactly one solution?
(c) no solution?

10. (BH) Solve the following system by the method of elimination:

\[ 2x_1 + 3x_2 - x_3 = 6, \quad (2.2a) \]
\[ 2x_1 - x_2 + 2x_3 = -8, \quad (2.2b) \]
\[ 3x_1 - x_2 + x_3 = -7. \quad (2.2c) \]