**Due date:**
Friday, 3/26, due 6pm, submit on-line through Canvas.

**Instructions:**
Students are encouraged to work together and discuss the homework problems, however each student must write up the solutions in their own words. Homework solutions should be well-explained.
The format of HW is not restricted, but the PDF file is the preferred one.

**Problem 1:** Let

$$\mathbf{v} = \begin{pmatrix} 1 \\ 2 \\ -1 \end{pmatrix} \qquad \text{and} \qquad W = span\left\{ \mathbf{v}_1 = \begin{pmatrix} 1 \\ -1 \\ 0 \end{pmatrix}, \mathbf{v}_2 = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} \right\}.$$

Decompose vector $\mathbf{v}$ into $\mathbf{v} = \mathbf{w} + \mathbf{z}$, where $\mathbf{w} \in W$ and $\mathbf{z} \in W^{\perp}$ with respect to the dot product. (Note that vectors $\mathbf{v}_1, \mathbf{v}_2$ are not orthogonal.)

**Problems:**

**Problems in [1]:**
Pages 203–204, problems 4.3.1(a)(d), 4.3.16(a), 4.3.20
Page 211, problems 4.3.27(c)
Pages 215–216, problems 4.4.3(c), 4.4.6 (Note that one needs to check that $(1, -1, 2, 5)^T, (2, 1, 0, -1)^T$ are orthogonal with respect to this weighted inner product before we can apply the orthogonal projection formula)
Pages 220–221, problems 4.4.13(a,b,c), 4.4.19(a,b)

## References

[1] Peter Olver and Chehrzad Shakiban, Applied Linear Algebra, 2nd Edition