Short HW 3: **Gram–Schmidt**

Course: Physics 017, *Linear Algebra for Physics* (S2022)
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Due by: **Thursday**, April 14 (yes, *this* Thursday)

Note that this short assignment is due by class on Thursday. You have only *two days* to do it. This should be quick, I recommend doing it right after class on Tuesday.

1 Gram–Schmidt for a vectors in 3D Euclidean Space

You are given three vectors that are *linearly independent*[1]:

$$\mathbf{v} = \begin{pmatrix} 1 \\ 0 \\ 3 \end{pmatrix} \qquad \mathbf{w} = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix} \qquad \mathbf{z} = \begin{pmatrix} -1 \\ -1 \\ 1 \end{pmatrix} \tag{1.1}$$

Perform the Gram–Schmidt procedure to derive an orthonormal basis from these vectors. The first basis vector $\mathbf{e}_{(1)}$ should be parallel to $\mathbf{v}$. The second basis vector $\mathbf{e}_{(2)}$ should be on the $\mathbf{v}$–$\mathbf{w}$ plane.

[1] This means that you cannot write any vector as a linear combination of the other vectors. That is: each vector has at least some component that points in a 'new' direction relative to the plane *spanned* by the other vectors.