Problem 1. Equation of a plane

The (non-unit-length) normal

\[ n = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix} \]

of a plane \( P \) is given. In addition, it is known that the point

\[ p = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} \]

is on the plane. What is the value \( \alpha \) on the right hand side of the point-normal equation \( n \cdot x = \alpha \) for \( P \)?

Problem 2. Find an orthogonal vector

Given

\[ x = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}, \]

find \( y_3 \) in

\[ y = \begin{bmatrix} -1 \\ 1 \\ y_3 \end{bmatrix} \]

so that \( x \perp y \).

Problem 3. Orthogonalization step

Given two vectors \( x \) and \( y \), which of the following makes \( x \perp y' \)?
(A) \( y' = y - \frac{(x,y)}{(x,x)} x \)

(B) \( y' = y - \frac{(x,y)}{(y,x)} x \)

(C) \( y' = y - \frac{(x,y)}{(y,.x)} y \)

(D) \( y' = y - \frac{(x,y)}{(y,y)} y \)

(E) \( y' = y - \frac{(x,y)}{(y,y)} x \)