Name: Solutions

Find the vector projection $\mathbf{p}$ of $\mathbf{x} = (3,5)^T$ onto $\mathbf{y} = (1,1)^T$ and verify that $\mathbf{p}$ and $\mathbf{x} - \mathbf{p}$ are orthogonal.

$$\bar{p} = \frac{\bar{x}^T \bar{y}}{\bar{y}^T \bar{y}} \bar{y} = \frac{3+5}{1+1} \bar{y} = 4\bar{y}$$

$$= \begin{pmatrix} 4 \\ 4 \end{pmatrix}.$$

$$\Rightarrow \bar{x} - \bar{p} = \begin{pmatrix} 3 \\ 5 \end{pmatrix} - \begin{pmatrix} 4 \\ 4 \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \end{pmatrix}$$

$$\Rightarrow \bar{p}^T (\bar{x} - \bar{p}) = (-4) + 4 = 0.$$