MATH 54 − SOLUTION TO 6.3.11

PEYAM TABRIZIAN

$$\begin{aligned}
\hat{\mathbf{y}} &= \left(\frac{\mathbf{y}\cdot\mathbf{v_1}}{\mathbf{v_1}\cdot\mathbf{v_1}}\right)\mathbf{v_1} + \left(\frac{\mathbf{y}\cdot\mathbf{v_2}}{\mathbf{v_2}\cdot\mathbf{v_2}}\right)\mathbf{v_2} \\
&= \left(\frac{9+1-5+1}{9+1+1+1}\right)\begin{bmatrix}3\\1\\-1\\1\end{bmatrix} + \left(\frac{3-1+5-1}{1+1+1+1}\right)\begin{bmatrix}1\\-1\\1\\-1\end{bmatrix} \\
&= \left(\frac{6}{12}\right)\begin{bmatrix}3\\1\\-1\\1\end{bmatrix} + \left(\frac{6}{4}\right)\begin{bmatrix}1\\-1\\1\\-1\end{bmatrix} \\
&= \left(\frac{1}{2}\right)\begin{bmatrix}3\\1\\-1\\1\end{bmatrix} + \left(\frac{3}{2}\right)\begin{bmatrix}1\\-1\\1\\-1\end{bmatrix} \\
&= \begin{bmatrix}\frac{3}{2}+\frac{3}{2}\\\frac{1}{2}-\frac{3}{2}\\-\frac{1}{2}+\frac{3}{2}\\\frac{1}{2}-\frac{3}{2}\end{bmatrix} \\
&= \begin{bmatrix}3\\-1\\1\\-1\end{bmatrix}
\end{aligned}$$

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