Math 40 Systems of Linear Equations Friday, January 26, 2016

1.2.{40, 42, 48, 50, 68, 70}

40 Find the projection of **v** onto **u** given $\mathbf{u} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} -2 \\ 4 \end{bmatrix}$. Then, draw a sketch.

42 Find the projection of **v** onto **u** given $\mathbf{u} = \begin{bmatrix} 1/2 \\ -1/4 \\ -1/2 \end{bmatrix}$ and $\mathbf{v} = \begin{bmatrix} 2 \\ 2 \\ -2 \end{bmatrix}$.

48 Find all values of the scalar k for which the two vectors are orthogonal. $\mathbf{u} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$, $\mathbf{v} = \begin{bmatrix} k+1 \\ k-1 \end{bmatrix}$.

$$\mathbf{u} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$$
, $\mathbf{v} = \begin{bmatrix} k+1 \\ k-1 \end{bmatrix}$.

50 Describe all vectors $\mathbf{v} = \begin{bmatrix} x \\ y \end{bmatrix}$ that are orthogonal to $\mathbf{u} = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$

68

- (a) Prove that if \mathbf{u} is orthogonal to both \mathbf{v} and \mathbf{w} , then \mathbf{u} is orthogonal to $\mathbf{v} + \mathbf{w}$.
- (b) Prove that if \mathbf{u} is orthogonal to both \mathbf{v} and \mathbf{w} , then \mathbf{u} is orthogonal to $s\mathbf{v} + t\mathbf{w}$ for all scalars s and t.

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70

- (a) Prove that $\text{proj}_u(\text{proj}_u(\mathbf{v})) = \text{proj}_u(\mathbf{v})$.
- (b) Prove that $proj_u(\mathbf{v} proj_u(\mathbf{v})) = \mathbf{0}$.
- (c) Explain (a) and (b) geometrically.

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