WebAssign
CH 5.4 (Homework)

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MA 265 Spring 2013, section 132, Spring 2013
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Current Score : 20 / 20 **Due :** Thursday, March 28 2013 11:40 PM EDT

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1. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.001.

Use the Gram-Schmidt process to transform the basis $\left\{\begin{bmatrix} 4 \\ 5 \end{bmatrix}, \begin{bmatrix} -5 \\ 6 \end{bmatrix}\right\}$ for the Euclidean space R^2 into an orthogonal basis and an orthonormal basis.

(a) orthogonal basis

4	-245/41
5	196/41

(b) orthonormal basis (Enter each vector in the form [x_1, x_2, ...]. Enter your answers as a comma-separated list.)

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2. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.003.

Consider the Euclidean space R_4 and let W be the subspace that has

$$S = \left\{\begin{bmatrix} 1 & 1 & -1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 5 & 0 & 5 \end{bmatrix}\right\}$$

as a basis. Use the Gram-Schmidt process to obtain an orthonormal basis for W. (Enter each vector in the form [x_1, x_2, ...]. Enter your answers as a comma-separated list.)

3. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.010.

Use the Gram-Schmidt process to transform the basis

$$\left\{\begin{bmatrix}1\\1\\1\end{bmatrix}, \begin{bmatrix}0\\1\\1\end{bmatrix}, \begin{bmatrix}5\\7\\1\end{bmatrix}\right\}$$

for the Euclidean space R^3 into an orthonormal basis for R^3. (Enter each vector in the form [x_1, x_2, ...]. Enter your answers as a comma-separated list.)

4. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.011.

Use the Gram-Schmidt process to construct an orthonormal basis for the subspace W of the Euclidean space R^3 *spanned* by

$$\left\{\begin{bmatrix}1\\1\\1\end{bmatrix}, \begin{bmatrix}2\\2\\2\end{bmatrix}, \begin{bmatrix}0\\0\\1\end{bmatrix}, \begin{bmatrix}4\\7\\6\end{bmatrix}\right\}.$$

(Enter each vector in the form [x_1, x_2, ...]. Enter your answers as a comma-separated list.)

5. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.014.

Find an orthonormal basis for the subspace of R_4 consisting of all vectors of the form

$$\begin{bmatrix} a & a+b & c & b+c \end{bmatrix}.$$

(Enter each vector in the form [x_1, x_2, ...]. Enter your answers as a comma-separated list.)

6. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.016.

Find an orthonormal basis for the subspace of R_4 consisting of all vectors $[\,a \quad b \quad c \quad d\,]$ such that

$$a - b + 2c - d = 0.$$

(Enter each vector in the form $[x_1, x_2, \ldots]$. Enter your answers as a comma-separated list.)

7. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.022.

Let W be the subspace of the Euclidean space R^3 with basis

$$S = \left\{ \begin{bmatrix} 1 \\ 0 \\ -2 \end{bmatrix}, \begin{bmatrix} -4 \\ -2 \\ 3 \end{bmatrix} \right\}.$$

Let $\mathbf{v} = \begin{bmatrix} -1 \\ -2 \\ -3 \end{bmatrix}$ be in W.

(a) Find the length of **v** directly.

(b) Using the Gram-Schmidt process, transform S into an orthonormal basis T for W. (Enter each vector in the form $[x_1, x_2, \ldots]$. Enter your answers as a comma-separated list.)

(c) Find the length of **v** by using the coordinate vector of **v** with respect to T. (Enter each vector in the form $[x_1, x_2, \ldots]$.)

$[\mathbf{v}]_T$ =

$||\mathbf{v}||$ =

8. 2.5/2.5 points | Previous Answers KolmanLinAlg9 5.4.028.

Consider the orthonormal basis

$$S = \left\{ \begin{bmatrix} \frac{1}{\sqrt{5}} \\ 0 \\ \frac{2}{\sqrt{5}} \end{bmatrix}, \begin{bmatrix} -\frac{2}{\sqrt{5}} \\ 0 \\ \frac{1}{\sqrt{5}} \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \right\}$$

for R^3. Using the following theorem:

> Let $S = \{\mathbf{u}_1, \mathbf{u}_2, \ldots, \mathbf{u}_n\}$ be an orthonormal basis for a Euclidean space V and let $\mathbf{v}$ be any vector in V. Then
>
> $$\mathbf{v} = c_1\mathbf{u}_1 + c_2\mathbf{u}_2 + \cdots + c_n\mathbf{u}_n,$$
>
> where
>
> $$c_i = (\mathbf{v}, \mathbf{u}_i), \quad i = 1, 2, \ldots, n$$

write the vector $\begin{bmatrix} 3 \\ -4 \\ 4 \end{bmatrix}$ as a linear combination of the vectors in S.

$$\begin{bmatrix} 3 \\ -4 \\ 4 \end{bmatrix} = \begin{bmatrix} \frac{1}{\sqrt{5}} \\ 0 \\ \frac{2}{\sqrt{5}} \end{bmatrix} + \begin{bmatrix} -\frac{2}{\sqrt{5}} \\ 0 \\ \frac{1}{\sqrt{5}} \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$