

Name: _____

No calculators. Put your final answer in the box shown.

No partial credit will be given and nothing outside the box will be graded.

Students should attempt to permanently retain the ability to do the skills on this quiz.

The skills problems will be worth 40% of your course grade, you will need to get perfect scores on most of these quizzes to achieve an A in the class.

1. Find values of a and b such that $\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3\}$ is an orthogonal set where

$$\mathbf{u}_1 = \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix}, \mathbf{u}_2 = \begin{bmatrix} 1 \\ 1 \\ -2 \end{bmatrix}, \mathbf{u}_3 = \begin{bmatrix} a \\ b \\ 2 \end{bmatrix}.$$

2. Let $\mathbf{e}_1 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$, $\mathbf{e}_2 = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$ be the standard basis vectors in \mathbb{R}^2 .

Write $\mathbf{v} = \begin{bmatrix} 2 \\ -3 \end{bmatrix}$ in terms of \mathbf{e}_1 and \mathbf{e}_2 .

3. Define $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$ by $T(\mathbf{x}) = A\mathbf{x} = \begin{bmatrix} -1 & -2 \\ 1 & 2 \end{bmatrix} \mathbf{x}$. Find $T(\mathbf{e}_1 - \mathbf{e}_2)$.

4. Determine if $\mathbf{u} = 2\mathbf{e}_1 - \mathbf{e}_2$ is in the null space of T of problem 3.

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1. $a = -1, b = 5$
2. $\mathbf{v} = 2\mathbf{e}_1 - 3\mathbf{e}_2$
3. $[1, -1]^T$.
4. Yes