Homework 9, Section 1.9; 8, 26, 30, 35

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Homework

8.

The matrix for the transformation is $\begin{bmatrix} 0 & -1 \\ -1 & 2 \end{bmatrix}$

26.

30.

By theorem 12, the columns of the standard matrix A must span $\mathbb{R}^3$. By theorem 4, the matrix must have a pivot in each row. There are four possibilities for the echelon form, however they result in an inconsistent system. Below is one. $\begin{bmatrix} 1 & * & * & * \\ 0 & 1 & * & * \\ 0 & 0 & 0 & 1 \end{bmatrix}$
where the asterisk can be any value.

35. A)

If $T : \mathbb{R}^n \to \mathbb{R}^m maps \mathbb{R}^n onto \mathbb{R}^M$, then its standard matrix A has a pivot in each row, by theorem 12 and 4.
This means that A must have at least as many columns as rows, so $\mathbb{R}^m \leq \mathbb{R}^n$. When T is one to one, A must have a pivot in each column by theorem 12, so $\mathbb{R}^m \geq \mathbb{R}^n$.