Answers to Even Assigned Problems in Homework Assignment #5

Section 4.1

Problem #	Answer
2	a. Given $\begin{bmatrix} x \\ y \end{bmatrix}$ in W and any scalar c, the vector $c\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} cx \\ cy \end{bmatrix}$ is in W because $(cx)(cy) = c^2(xy) \geq 0$, since $xy \geq 0$. b. *Example:* If $u = \begin{bmatrix} -1 \\ -7 \end{bmatrix}$ and $\begin{bmatrix} 2 \\ 3 \end{bmatrix}$, then u and v are in W, but $u + v$ is not in W.
8	Yes. The zero vector is in the set, H. If p and q are in H, then $(p + q)(0) = p(0) + q(0) = 0$, so $p + q$ is in H. Also, for any scalar c $(cp)(0) = c \cdot p(0) = c \cdot 0 = 0$, so cp is in H.
10	$H = \text{Span}\{v\}$, where $v = \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix}$. By Theorem 1, H is a subspace of $\mathbb{R}^3$.
14	No, because the equation $c_1v_1 + c_2v_2c_3v_3 = w$ has no solution, as revealed by an echelon form of the augmented matrix for this equation.
16	Not a vector space because the zero vector is not in W.
24	a. True. See the definition of a vector space. b. True. See statement (3) in the box before example 1. c. True. See the paragraph before Example 6. d. False. See Example 8 e. False. The second and third parts of the conditions are stated incorrectly. In part (ii) here, for example, there is no statement that u and v represent all possible elements of H.

Section 4.2

Problem #	Answer
4	$\begin{bmatrix} 6 \\ 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix}$
18	a. 3 b. 4
20	a. 5 b. 1
26	a. True. See Theorem 2. (A subspace is itself a vector space.) b. True. See Theorem 3. c. False. See the box after Theorem 3. d. True. See the paragraph after the definition of a linear transformation. e. True. See Fig. 2. (A subspace is itself a vector space.) f True. See the paragraph before Example 8.