# Homework 6 Solutions

2.7 # 18: Multiply the matrices and check:

$$\begin{bmatrix} 2 & 3 & -1 \\ 1 & 2 & 1 \\ -1 & -1 & 3 \end{bmatrix} \cdot \begin{bmatrix} 7 & -8 & 5 \\ -4 & 5 & -3 \\ 1 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$

2.7 # 20 (a) Here $ad - bc = -5$, so the formula from Exercise 19 gives

$$\mathbf{A}^{-1} = \begin{bmatrix} -3/5 & 2/5 \\ 1/5 & 1/5 \end{bmatrix}.$$

(b)

$$\mathbf{A}^3 = \begin{bmatrix} 1 & 18 \\ 9 & 37 \end{bmatrix}$$

(c)

$$(\mathbf{A}^{-1})^3 = \frac{1}{125} \begin{bmatrix} -37 & 18 \\ 9 & -1 \end{bmatrix}$$

(d) Multiply the last two matrices and check that you get $I_2$.

Extra problem: (a)

$$\begin{bmatrix} 1 & 1 & 0 & -1 \\ 1 & 1 & -1 & 1 \\ 0 & 1 & 1 & -4 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

(b)

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & -2 \end{bmatrix} \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

(c) With $z$ as a free variable, the general solution is $w = -z$, $y = x = 2z$. With $z = 1$, we get $\begin{bmatrix} w & x & y & z \end{bmatrix} = \begin{bmatrix} -1 & 2 & 2 & 1 \end{bmatrix}$.