SECTION 2.1 (Let me know if you see any typos and I'll correct them. –RH)

4. (a) $A+B=\begin{bmatrix} 4 & -2 & 5 \\ -4 & 0 & 2 \end{bmatrix}$

   (b) $A-B=\begin{bmatrix} 0 & 4 & -3 \\ 2 & -2 & 6 \end{bmatrix}$

   (c) $2A=\begin{bmatrix} 4 & 2 & 2 \\ -2 & -2 & 8 \end{bmatrix}$

   (d) $2A-B=\begin{bmatrix} 2 & 5 & -2 \\ 1 & -3 & 10 \end{bmatrix}$

12. (a) $AB=[12]$

    (b) $BA=\begin{bmatrix} 6 & 4 & 2 \\ 9 & 6 & 3 \\ 0 & 0 & 0 \end{bmatrix}$

18. (a) AB (Can't do—matrices don't match)

    (b) $BA=\begin{bmatrix} 37 & 78 & 51 & -104 & 124 \\ 16 & 26 & 28 & -42 & 56 \end{bmatrix}$

22. The system becomes $\begin{bmatrix} 2 & 2 \\ -6 & -6 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}=\begin{bmatrix} 7 \\ -21 \end{bmatrix}$

    To find x_1 and x_2, we solve the system in the usual way. $\begin{bmatrix} 2 & 2 & 7 \\ -6 & -6 & -21 \end{bmatrix}$ $R_2+3R_1 \to R_2$

    $\begin{bmatrix} 2 & 2 & 7 \\ 0 & 0 & 0 \end{bmatrix}$ $1/2R_1 \to R_1$ $\begin{bmatrix} 1 & 1 & 7/2 \\ 0 & 0 & 0 \end{bmatrix}$ Solution: $x_1 = 7/2 - t,\ \ x_2 = t$, where t is any real number.

30. Solve the matrix equation for a, b, c and d.

    $\begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} 2 & 1 \\ 3 & 1 \end{bmatrix}=\begin{bmatrix} 3 & 17 \\ 4 & -1 \end{bmatrix}$

    First, multiply and get $\begin{bmatrix} 2a+3b & a+b \\ 2c+3d & c+d \end{bmatrix}=\begin{bmatrix} 3 & 17 \\ 4 & -1 \end{bmatrix}$

    The fact that the corresponding entries are equal gives the following system in variables a, b, c and d.

$$\begin{cases} 2a + 3b = 3 \\ a + b = 17 \\ 2c + 3d = 4 \\ c + d = -1 \end{cases}$$

    Solving this in the usual way,

$$\begin{bmatrix} 2 & 3 & 0 & 0 & 3 \\ 1 & 1 & 0 & 0 & 17 \\ 0 & 0 & 2 & 3 & 4 \\ 0 & 0 & 1 & 1 & -1 \end{bmatrix} \quad \begin{matrix} R_1 \leftrightarrow R_2 \\ R_3 \leftrightarrow R_4 \end{matrix} \quad \begin{bmatrix} 1 & 1 & 0 & 0 & 17 \\ 2 & 3 & 0 & 0 & 3 \\ 0 & 0 & 1 & 1 & -1 \\ 0 & 0 & 2 & 3 & 4 \end{bmatrix} \quad \begin{matrix} R_2 - 2R_1 \to R_2 \\ R_4 - 2R_3 \to R_4 \end{matrix}$$

$$\begin{bmatrix} 1 & 1 & 0 & 0 & 17 \\ 0 & 1 & 0 & 0 & -31 \\ 0 & 0 & 1 & 1 & -1 \\ 0 & 0 & 0 & 1 & 6 \end{bmatrix} \quad \begin{matrix} R_1 - R_2 \to R_1 \\ R_3 - R_4 \to R_3 \end{matrix} \quad \begin{bmatrix} 1 & 0 & 0 & 0 & 48 \\ 0 & 1 & 0 & 0 & -31 \\ 0 & 0 & 1 & 0 & -7 \\ 0 & 0 & 0 & 1 & 6 \end{bmatrix}$$

    The solutions are $a = 48, b = -31, c = -7, d = 6$, so the matrix we seek is $\begin{bmatrix} a & b \\ c & d \end{bmatrix}=\begin{bmatrix} 48 & -31 \\ -7 & 6 \end{bmatrix}$.