SECTION 3.1

6. (b) $\begin{vmatrix} 3 & 1 & 4 \\ -7 & -2 & 1 \\ 9 & 1 & -1 \end{vmatrix} = 3\begin{vmatrix} -2 & 1 \\ 1 & -1 \end{vmatrix} - \begin{vmatrix} -7 & 1 \\ 9 & -1 \end{vmatrix} + 4\begin{vmatrix} -7 & -2 \\ 9 & 1 \end{vmatrix}$

$= 3[(-2x-1) - (1x1)] - [(-7x-1) - (1x9)] + 4[(-7x1) - (-2x9)]$

$= 3 - (-2) + 4(11) = 49.$ ✓

"diagonals" method:

$(3x-2x-1) + (1x1x9) + (4x-7x1) - (4x-2x9) - (3x1x1) - (1x-7x-1)$

$= 6 + 9 + (-28) - (-72) - 3 - 7 = 49.$ ✓

13. $\begin{vmatrix} 2x & -3 \\ x-1 & x+2 \end{vmatrix} = (2x)(x+2) - (-3)(x-1) = 2x^2 + 4x - (-3x) - 3 = 1$, so $2x^2 + 7x - 4 = 0$.

$(2x-1)(x+4) = 0$, so there are two solutions, $x = 1/2$ and $x = -4$. ✓

SECTION 3.2

4. (a) The given matrix can be obtained from A by interchanging columns 2 and 3, so its determinant is $-|A| = -5$. ✓

(b) The given matrix can be obtained from A by adding -2 times column 3 to column 2, so its determinant is $|A| = 5$. ✓

(c) The given matrix is the transpose of A, and $|A^t| = |A| = 5$. ✓

5. The second answer is correct. 2R1 - R3 does not preserve the value of the determinant. It multiplies the determinant by 2 before subtracting R3. ✓

10. (a) The given matrix can be obtained from A by interchanging rows 1 and 2 and then interchanging rows 2 and 3. Thus its determinant is $(-1)(-1)|A| = 3$.

(b) The given matrix can be obtained from A by interchanging rows 1 and 2 and then taking the transpose. Thus its determinant is $(-1)|A| = -3$.

(c) The given matrix can be obtained from A by interchanging rows 1 and 2 and then interchanging columns 2 and 3 in the resulting matrix. Thus the determinant of the given matrix is $(-1)(-1)|A| = 3$.

(d) The given matrix can be obtained from A by interchanging rows 1 and 2 of A and multiplying row 3 by 2. Thus the determinant is $(-1)(2)|A| = -6$.

20. $|AB| = |A||B| = |B||A| = |BA|$.

SECTION 3.3

5. (b) The determinant is 1.

$\begin{bmatrix} -2 & -1 \\ 7 & 3 \end{bmatrix}^{-1} = \begin{bmatrix} 3 & 1 \\ -7 & -2 \end{bmatrix}.$

6. (d) The determinant is zero.
The inverse does not exist.

11. (b) $|A| = \begin{vmatrix} 2 & -1 & 3 \\ 1 & 4 & 2 \\ 3 & 2 & 1 \end{vmatrix} = -35$, ✓ $|A_1| = \begin{vmatrix} 7 & -1 & 3 \\ 10 & 4 & 2 \\ 0 & 2 & 1 \end{vmatrix} = 70$, $|A_2| = \begin{vmatrix} 2 & 7 & 3 \\ 1 & 10 & 2 \\ 3 & 0 & 1 \end{vmatrix} = -35$,

$|A_3| = \begin{vmatrix} 2 & -1 & 7 \\ 1 & 4 & 10 \\ 3 & 2 & 0 \end{vmatrix} = -140$, so $x_1 = \frac{70}{-35} = -2$, $x_2 = \frac{-35}{-35} = 1$, $x_3 = \frac{-140}{-35} = 4$. ✓

12. (b) $|A| = \begin{vmatrix} 3 & 1 & -1 \\ 1 & 2 & 1 \\ 2 & 6 & 0 \end{vmatrix} = -18$, $|A_1| = \begin{vmatrix} 7 & 1 & -1 \\ 3 & 2 & 1 \\ -4 & 6 & 0 \end{vmatrix} = -72$, $|A_2| = \begin{vmatrix} 3 & 7 & -1 \\ 1 & 3 & 1 \\ 2 & -4 & 0 \end{vmatrix} = 36$,

$|A_3| = \begin{vmatrix} 3 & 1 & 7 \\ 1 & 2 & 3 \\ 2 & 6 & -4 \end{vmatrix} = -54$, so $x_1 = \frac{-72}{-18} = 4$, $x_2 = \frac{36}{-18} = -2$, $x_3 = \frac{-54}{-18} = 3$.

14. (b) The determinant of the coefficient matrix is zero, so there is not a unique solution.