Math 141 - Week in Review #2 Answer Key

1. $x = 31, y = 22$

2. Infinitely many solutions; parametric solution: $(t, \frac{1}{2}t - 3)$

3. (a) $k = -\frac{15}{7}$
   (b) No. If a system with two variables and two equations has infinitely many solutions, then the two equations represent the same line, meaning both lines have the same slope AND the same y-intercept. The only value of k that makes the lines have the same slope is $k = -\frac{15}{7}$. However, when you substitute this value of k into the y-intercept for the second equation, you see that the y-intercept for the second line is -7. Since the y-intercept of the first line was $\frac{3}{5} \neq -7$, there is no value of k that makes the two lines exactly the same.
   (c) any $k \neq -\frac{15}{7}$

4. Let x equal the number of vans to be purchased.
   Let y equal the number of small trucks to be purchased.
   Let z equal the number of large trucks to be purchased.

$$\begin{aligned} x + y + z &= 200 \\ 20,000x + 30,000y + 50,000z &= 6,000,000 \\ x &= 2y \end{aligned}$$

5. Let x equal the number of ones in the register.
   Let y equal the number of fives in the register.
   Let z equal the number of tens in the register.

$$\begin{aligned} x + y + z &= 96 \\ y &= 3x \\ x + y &= \tfrac{1}{2}z \end{aligned}$$

6. Let x equal the number of small collages to be made each week.
   Let y equal the number of medium collages to be made each week.
   Let z equal the number of large collages to be made each week.

$$\begin{aligned} 30x + 60y + 90z &= 22,800 \\ 36x + 54y + 72z &= 19,800 \\ x &= 2y \end{aligned}$$

7. (a) $\begin{bmatrix} 17 & 4 & 2 \\ 14 & 25 & 6 \end{bmatrix}$
   (b) C and B are not the same size, so we cannot add them.
   (c) $\begin{bmatrix} 8 & 3 & -25 \\ 23 & 24 & 46 \end{bmatrix}$
   (d) 25
   (e) Not possible. The number of columns of D does not equal the number of rows of B.

(f) $\begin{bmatrix} 34 & -60 \\ 11 & 20 \end{bmatrix}$

(g) Not possible. The number of columns of C does not equal the number of rows of D^T.

(h) $\begin{bmatrix} 38 & -35 \\ -35 & 149 \end{bmatrix}$

(i) $\begin{bmatrix} 16+3x & -3x \\ -9 & 3x+49 \end{bmatrix}$

8. $x = -2, y = \frac{1}{3}$

9. (a) $T = \begin{bmatrix} 45 & 15 & 10 \\ 30 & 10 & 5 \end{bmatrix}$

(b) $MT = \begin{bmatrix} 10500 & 3500 & 2000 \end{bmatrix}$ The three entries of this matrix represent the total amount of time (in minutes) spent assembling, testing, and packaging, respectively, for the entire order of large and small food processors.

(c) Let $C = \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}$. Then $TC = \begin{bmatrix} 170 \\ 110 \end{bmatrix}$.

10. $A^{-1} = \begin{bmatrix} -\frac{5}{43} & \frac{7}{86} \\ \frac{4}{43} & \frac{3}{86} \end{bmatrix}$

11. B is a singular matrix. (B does not have an inverse.)

12. $x = -1, y = 0, z = -5$