Solutions to sample problems 1

5. \( y - 15 = \frac{5}{11} (x - 0) \)

6. (a) \( C(x) = 8x + 48,000 \)
   (b) $40
   (c) \( R(x) = 40x \)
   (d) \( P(x) = 32x - 48,000 \)
   (e) 1500 items

7. (a) equilibrium price $6
   (b) equilibrium quantity 7

8. (a) \( y = -0.0864x + 11.8636 \)
   (b) see class notes.
   (c) 10.5676 million cows
   (d) \( P(x) = 32x - 48,000 \)
   (e) 1500 items

9. (a) equilibrium price $6
   (b) equilibrium quantity 7

10. There is more than one answer for this problem.

\[
\begin{bmatrix}
1 & 0 & 2 & 7 \\
0 & 1 & 5 & 8
\end{bmatrix}
\]

11. There is more than one answer for this problem.

\[
\begin{bmatrix}
1 & 0 & 0 & 6 \\
0 & 1 & 0 & 5 \\
0 & 0 & 1 & 8 \\
0 & 0 & 0 & 0
\end{bmatrix}
\]

12. (a) \( x = \) the amount invested in high-risk stocks.
    \( y = \) the amount invested in medium-risk stocks.
    \( z = \) the amount invested in low-risk stocks.

II) \( x + y + z = 300,000 \)
    \( .16x + .10y + .04z = 33,000 \)
    \( 2x - y + 2z = 0 \)

III) \( x = $75,000, \ y = $200,000, \) and \( z = $25,000 \)

(b) \( x = \) number of tank cars purchased with 6,000 gallon capacity
    \( y = \) number of tank cars purchased with 8,000 gallon capacity

13. \( R_1(\frac{3}{7}) \rightarrow R_1 \)

\[
\begin{bmatrix}
3 & 6 & 15 & 9 \\
7 & 12 & 39 & 25 \\
2 & 6 & 5 & 4 \\
3 & 0 & 6 & 1
\end{bmatrix}
\]

R_2 + (-7)R_1 \rightarrow R_2

R_3 + (-2)R_4 \rightarrow R_3

14. \( x = 20, \ y = -11, \ u = 5, \) and \( z = -2 \)

15. \( K = \begin{bmatrix}
7 & -8 & 5 \\
-24.5 & 27 & -8.5 \\
105 & -100 & 19
\end{bmatrix} \)
16. There is more than one solution for this problem. As long as matrix A and B are not square matrices and the number of rows in matrix B is equal to the number of columns in matrix A, you will have a solution.

\[ A = \begin{bmatrix} 1 & 1 & 3 \\ 3 & 4 & 2 \end{bmatrix} \]

\[ B = \begin{bmatrix} 1 & 2 & 4 & 6 \\ 2 & 8 & 4 & 2 \\ 1 & 4 & 5 & 6 \end{bmatrix} \]

17. \( D + C = \) not possible: not same dim.

\[ D - 3B = \begin{bmatrix} -2 & 1 & -9 \\ -1 & -3 & -1 \end{bmatrix} \]

\[ DC = \begin{bmatrix} 1 & -6 \\ 7 & 6 \end{bmatrix} \]

\( DA = \) not possible: the number of rows in A is not equal to the number of cols. in D.

\[ B + CT = \begin{bmatrix} 2 & -1 & 7 \\ -2 & 4 & 0 \end{bmatrix} \]

\( B^{-1} \) not possible B is not square.

\[ A^{-1} = \begin{bmatrix} 1 & 0 \\ -0.5 & -0.5 \end{bmatrix} \]

\( E^{-1} \) not possible, singular matrix.

18. (a) \( WP = \begin{bmatrix} 68.05 \\ 60.10 \end{bmatrix} \)

(b) Each number represents the hourly rate for each crew. John’s crew has an hourly rate of $68.05 and Matt’s crew has an hourly rate of $60.10.

19. (a) \( x = -14, y = 39, z = -9 \)

(b) \( x = -12, y = 37, z = -10 \)