Math 141 Exam 1 Review Answer Key

1. \( y = \frac{2}{3}x - \frac{4}{7} \)

2. \( n = \frac{8}{3} \)

3. (a) \( s = 6 \)
   (b) \( P(x) = 4x - 1500 \)
   (c) \( (375, 2250) \)
       Break-even quantity: 375 keychains
       Break-even revenue: $2250

4. (a) Demand: \( p = -\frac{1}{8}x + 75 \)
       Supply: \( p = \frac{1}{3}x + 15 \)
   (b) \( (160, 55) \)
       Equilibrium quantity: 160 tents
       Equilibrium price: $55

5. (a) \( y = 0.3x + 10.2 \)
   (b) 12, 300
   (c) 2018
   (d) \( r = 0.3198; |r| \) is not very close to 1, so the line does not model the data very well.

6. (a) Row-reduced; No solution.
   (b) Not row-reduced; \( R_1 - 9R_2 \)
   (c) Row-reduced; Exactly one (unique) solution.
   (d) Not row-reduced; \( R_3 - R_2 \)
   (e) Not row-reduced; \( \frac{1}{3}R_2 \)
   (f) Row-reduced; Infinitely many solutions.

7. Step 1: \( \frac{1}{4}R_1; \) Resulting matrix:
   \[
   \begin{bmatrix}
   1 & 2 & 8 \\
   -3 & -5 & -18
   \end{bmatrix}
   \]
   Step 2: \( R_2 + 3R_1; \) Resulting matrix:
   \[
   \begin{bmatrix}
   1 & 2 & 8 \\
   0 & 1 & 6
   \end{bmatrix}
   \]
   Step 3: \( R_1 - 2R_2; \) Resulting matrix:
   \[
   \begin{bmatrix}
   1 & 0 & -4 \\
   0 & 1 & 6
   \end{bmatrix}
   \]

8. Let \( x = \) number of Cokes, \( y = \) number of Pepsis
   \[
   58x + 63y = 1326 \\
   243x + 250y = 5416
   \]
   Solution: \( (12, 10): 12 \) Cokes, 10 Pepsis

9. (a) No solution
   (b) Infinitely many solutions: \( (3 - t, -1 + t, t) \) where \( t \) is any number
10. \( a = 8, b = -4, c = 21, d = \frac{1}{2} \)

11. \( B = \begin{bmatrix} 5 & 3 & 6 \end{bmatrix}; BA = \begin{bmatrix} 129 & 133 \end{bmatrix} \)

It would cost John $129 if he orders from Papa John’s and $133 if he orders from Pizza Hut.

12. (a) Possible
(b) Not possible
(c) Possible
(d) Possible
(e) Not possible

13. (a) Let \( x = \) number of Southwest flights, \( y = \) number of Delta flights, \( z = \) number of American flights
\[ 135x + 160y + 148z = 88683 \]
\( x = 3y \)
\( z = \frac{1}{2}(x + y) \)

(b) \[ \begin{bmatrix} 135 & 160 & 148 \\ 1 & -3 & 0 \\ -\frac{1}{2} & -\frac{1}{2} & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 88683 \\ 0 \\ 0 \end{bmatrix} \]

(c) \( X = A^{-1}B = \begin{bmatrix} 309 \\ 103 \\ 206 \end{bmatrix} \)

There were 309 Southwest flights, 103 Delta flights, and 206 American flights.

14. (a) \( A = \begin{bmatrix} .2 & .3 & .2 \\ .1 & .4 & .1 \\ .1 & .3 & .3 \end{bmatrix} \)

(b) \( X = \begin{bmatrix} 1700 \\ 1200 \\ 1050 \end{bmatrix} \)

(c) \( AX = X - D = \begin{bmatrix} 910 \\ 755 \\ 845 \end{bmatrix} \)