Week in Review # 2

1. First get rid of the fractions.

   $4 * \left(\frac{5x}{4} + \frac{y}{4} = 1\right)$
   $6 * \left(\frac{x}{3} - \frac{y}{2} = \frac{5}{6}\right)$

   $5x + y = 4$
   $2x - 3y = 5$

   solve using any methods taught in class.

   Answer: $x = 1$, $y = -1$

2. Solve both of these lines for y.

   $y = \frac{2}{3}x + 3$
   $y = \frac{k}{2}x + 3$

   Both line have the same y-intercept, this means either both lines intersect at infinitely many points(i.e. same slope) or at only one point (i.e. different slopes).

   The slopes are the same when $\frac{2}{3} = \frac{k}{2}$ or $k = \frac{4}{3}$. Thus the lines will have exactly one solution whenever $k \neq \frac{4}{3}$

3. $x =$ the number of senior tickets sold.
   $y =$ the number of adult tickets sold.
   $z =$ the number of children tickets sold.

   $x + y + z = 700$
   $6x + 8y + 3.5z = 3512.5$
   $3y = z$

4. $x =$ the number of Boeing 747s bought.
   $y =$ the number of Boeing 777s bought.
   $z =$ the number of Airbus A321s bought.

   $x + y + z = 11$
   $400x + 300y + 200z = 3200$
   $200x + 160y + 60z = 1540$

5. $x =$ the amount invested in low-risk stocks.
   $y =$ the amount invested in high-risk stocks.
   $z =$ the amount invested in bonds.

   $x + y + z = 82000$
   $y = x + z$
   $0.08x + 0.15y + 0.04z = 9050$

6. (a) $3d_{2,2} + 2c_{2,1} = 3(5) + 2(-2) = 11$

   (b) $\begin{bmatrix} 21 & 6 & 12 \\ 18 & 15 & 0 \end{bmatrix}$

   (c) $\begin{bmatrix} 1 & -2 & 2 \\ 3 & 5 & 0 \end{bmatrix}$

   (d) $\begin{bmatrix} 25 & 8 & 4 \\ 4 & 9 & 16 \end{bmatrix}$

   (e) $\begin{bmatrix} -15 & -6 & 12 \\ 22 & 7 & -32 \end{bmatrix}$

   (f) not possible, wrong sizes.

   (g) $\begin{bmatrix} -9 & 3 \\ -14 & 15 \\ 2 & 0 \end{bmatrix}$

7. simplify the left and right side.

   $\begin{bmatrix} 19 & 8x\text{-}3y \\ 4y\text{-}18 & 10 \end{bmatrix} = \begin{bmatrix} 19 & -28 \\ x & 10 \end{bmatrix}$

   Now solve
   $8x - 3y = -28$
   $4y - 18 = x$

   Answer: $x = -2$, $y = 4$

8. (a) $\begin{bmatrix} 11 & 31 \\ -4 & 43 \end{bmatrix}$

   (b) not possible since B has 3 columns and D has only two rows.

   (c) $\begin{bmatrix} 9x - 1 & 3x + 2 & 8 \\ 13 & 16 & 40 \end{bmatrix}$

   (d) $\begin{bmatrix} x^2 + 2 & x + 5 \\ 2x + 10 & 27 \end{bmatrix}$

   (e) $\begin{bmatrix} 2 & 8 & 16 \\ 4 & 6 & 0 \\ 0 & 2 & 10 \end{bmatrix}$

9. (a) The numbers in the matrix LM do not represent any usable information.

   The first number in the matrix LM is found by the computation $9*30+4*7$. The 9 is the number of ounces of Food I and 30 is the number of units of vitamin A in each ounce of Food I giving a result of 270 which is the number of units of Vitamin A eaten for lunch. The 4 is the number of ounces of Food II and the 7 is the number of units of vitamin C in each ounce of Food I giving a result of 28 which has no meaning whatsoever.

   (b) The numbers in MB^T are the number of units of Vitamin A (330) and Vitamin C (125) eaten at breakfast.

10. $\begin{bmatrix} 0.4 & -0.2 \\ -1 & 1 \end{bmatrix}$

11. $\begin{bmatrix} 3 & -1 & -1 \\ -4 & 2 & 1 \\ -1 & 0 & 1 \end{bmatrix}$

12. no inverse exists.

13. (a) $\begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & -1 \\ 3 & 1 & -1 \end{bmatrix}$

(b) $\begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & -1 \\ 3 & 1 & -1 \end{bmatrix} \begin{bmatrix} \text{x} \\ \text{y} \\ \text{z} \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 4 \end{bmatrix}$

(c) $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & -1 \\ 3 & 1 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 2 \\ 1 \\ 4 \end{bmatrix}$ and

$X = A^{-1}B = \begin{bmatrix} 3 \\ -9 \\ -4 \end{bmatrix}$

Answer: $x = 3$, $y = -9$, and $z = -4$

14. (a) $X = (B + C)^{-1} * E$

(b) $X = K * (J + A)^{-1}$