

HW 2H: 3, 6, 8

$$3.) a.) \begin{cases} 2x - 3y = 8 \\ 4x - y = 11 \end{cases} \quad i.) \begin{pmatrix} 2 & -3 \\ 4 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 11 \end{pmatrix} \quad \det = -2 + 12 = 10$$

$$\therefore \begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{10} \begin{pmatrix} -1 & 3 \\ -4 & 2 \end{pmatrix} \begin{pmatrix} 8 \\ 11 \end{pmatrix} = \frac{1}{10} \begin{pmatrix} -8 + 33 \\ -32 + 22 \end{pmatrix} = \frac{1}{10} \begin{pmatrix} 25 \\ -10 \end{pmatrix}$$

$$\therefore \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5/2 \\ -1 \end{pmatrix}$$

$$\boxed{x = 5/2} \quad \boxed{y = -1}$$

$$b.) \begin{cases} 2x + ky = 8 \\ 4x - y = 11 \end{cases} \quad i.) \begin{pmatrix} 2 & k \\ 4 & -1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ 11 \end{pmatrix} \quad \det = \boxed{-2 - 4k}$$

$$ii.) -2 - 4k \neq 0$$

$$-4k \neq 2$$

$$\boxed{k \neq -1/2}$$

b. cont.) $k \neq -\frac{1}{2}$ $\begin{pmatrix} x \\ y \end{pmatrix} = \frac{-1}{4k+2} \begin{pmatrix} -1 & -k \\ -4 & 2 \end{pmatrix} \begin{pmatrix} 8 \\ 11 \end{pmatrix}$

$$= \frac{-1}{4k+2} \begin{pmatrix} -8-11k \\ -32+22 \end{pmatrix} \Rightarrow \frac{-1}{4k+2} \begin{pmatrix} -8-11k \\ -10 \end{pmatrix}$$

$$\therefore \boxed{x = \frac{8+11k}{4k+2}} \quad \boxed{y = \frac{10}{4k+2} = \frac{5}{2k+1}}$$

iii. $\boxed{k = -\frac{1}{2}}$; $2x - \frac{1}{2}y = 8 \rightarrow 4x - y = 16$
 $4x - y = 11 \quad + \quad -4x + y = -11$

$0 \neq 5$ No solution

6.) $M = \begin{pmatrix} 5 & 3 & -7 \\ -1 & -3 & 3 \\ -3 & -1 & 5 \end{pmatrix}$ $N = \begin{pmatrix} 3 & 2 & 3 \\ 1 & -1 & 2 \\ 2 & 1 & 3 \end{pmatrix}$

$$MN = \begin{pmatrix} 15+3-14 & 10-3-7 & 15+6-21 \\ -3-3+6 & -2+3+3 & -3-6+9 \\ -9-1+10 & -6+1+5 & -9-2+15 \end{pmatrix} = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{pmatrix}$$

b.) \therefore det of the system is $\frac{1}{4} \begin{pmatrix} 5 & 3 & -7 \\ -1 & -3 & 3 \\ -3 & -1 & 5 \end{pmatrix}$

$$\begin{pmatrix} u \\ v \\ w \end{pmatrix} = \frac{1}{4} \begin{pmatrix} 5 & 3 & -7 \\ -1 & -3 & 3 \\ -3 & -1 & 5 \end{pmatrix} \begin{pmatrix} 18 \\ 6 \\ 16 \end{pmatrix} = \frac{1}{4} \begin{pmatrix} 90+18-112 \\ -18-18+48 \\ -54-6+80 \end{pmatrix} = \frac{1}{4} \begin{pmatrix} -4 \\ 12 \\ 20 \end{pmatrix} = \begin{pmatrix} -1 \\ 3 \\ 5 \end{pmatrix}$$

$\therefore \boxed{u = -1, v = 3, w = 5}$

8.) a) x = cost of a football
 y = cost of a baseball
 z = cost of a basketball

b.) Solve the system using technology to find the cost of each item. \Rightarrow

$$\begin{bmatrix} 21 \\ 16.5 \\ 25.5 \end{bmatrix}$$

\therefore footballs - \$21 each

baseballs - \$16.50 each

basketballs - \$25.50 each

$$\therefore 4(21) + 5(16.50) + 25.5z = 470$$

$$84 + 82.50 + 25.5z = 470$$

$$166.50 + 25.5z = 470$$

$$\frac{25.5z}{25.5} = \frac{303.5}{25.5}$$

$$z = 11.9$$

\therefore They can purchase 11 basketballs