1.1

Q11- $3x-2y=4$, $6x-4y=9$

$-\cancel{6x}+\cancel{4y}=-8 \quad \times(-2)$

$\cancel{6x}-\cancel{4y}=9$

$\underline{0=1}$ → no solutions ✓

no pts of intersection

c) $x-2y=0$, $x-4y=8$

$-x+2y=0$

$\underline{x-4y=8}$

$-2y=8$

$\underline{y=-4}$, $x\underline{=}-8$

→ $(-8,-4)$

b) $2x-4y=1$, $4x-8y=2$

$-\cancel{4x}+\cancel{8y}=-2$

$\underline{\cancel{4x}-8y=2}$

$0=0$ → infinitely many solutions

as $x=\frac{1}{2}+2t$; $y=t$ is an arbitary constant

*

Q12- $2x-3y=a$
$4x-6y=b$

→ when $b=2a$, there are infinitely many solutions,
when $b\neq 2a$, there are no solutions, not at least 1.

$-\cancel{4x}+\cancel{6y}=-2a$

$\cancel{4x}-6y=b$

$b-2a=0$ → $b\underline{=}2a$, $a=\frac{b}{2}$

Q19- (a) $\begin{bmatrix} 1 & k & -4 \\ 4 & 8 & 2 \end{bmatrix}$

$\begin{bmatrix} -4 & -4k & 16 \\ 4 & 8 & 2 \end{bmatrix}$

$(8-4k)\,y = 18$

✓

$k = 2 \rightarrow$ no solutions (inconsistent)

$k \neq 2 \rightarrow$ solutions obtained (consistent)

(b) $\begin{bmatrix} 1 & k & -1 \\ 4 & 8 & 4 \end{bmatrix}$

$R_2 - 4R_1$ $\begin{bmatrix} 1 & k & -1 \\ 0 & 8-4k & 0 \end{bmatrix}$

$x + ky = -1$
$(8-4k)y = 0$

✓

$k = 2 \rightarrow$ infinitely many solutions $\rightarrow$ consistent

$k \neq 2 \rightarrow$ only one solution consistent

20 (a) $\begin{bmatrix} 3 & -4 & k \\ -6 & 8 & 5 \end{bmatrix} \rightarrow$

$R_2 + 2R_1$ $\begin{bmatrix} 3 & -4 & k \\ 0 & 0 & 2k+5 \end{bmatrix}$

$\rightarrow$ $3x - 4y = k$
$0 = 2k+5$

✓

$k = -\frac{5}{2}$, infinitely many solutions, consistent

$k \neq -\frac{5}{2}$, no solutions

(b) $\begin{bmatrix} k & 1 & -2 \\ 4 & -1 & 2 \end{bmatrix}$

$R_2 + R_1$ $\begin{bmatrix} k & 1 & -2 \\ 4+k & 0 & 0 \end{bmatrix}$

$kx + y = -2$
$(4+k)\,x = 0$

✓

$\rightarrow$ $k = -4 \rightarrow$ infinitely many solutions

$k \neq -4 \rightarrow$ $\underline{\underline{x=0}} \rightarrow \underline{\underline{y=-2}}$, thus consistent

Q9- $2x_1 - 4x_2 - x_3 = 1$
$x_1 - 3x_2 + x_3 = 1$
$3x_1 - 5x_2 - 3x_3 = 1$

$$\begin{bmatrix} 2 & -4 & -1 & 1 \\ 1 & -3 & 1 & 1 \\ 3 & -5 & -3 & 1 \end{bmatrix}$$

$+\frac{3}{2}$ $-3+1.5$

$$= \begin{bmatrix} 2 & -4 & -1 & 1 \\ 1 & -3 & 1 & 1 \\ 0 & 1 & -\frac{3}{2} & \frac{1}{2} \end{bmatrix} \qquad R_3 - \frac{3}{2}R_1$$

$\begin{array}{r} 3.0 \\ 1.5 \\ \hline 1.5 \\ \hline \end{array}$

$$= \begin{bmatrix} 2 & -4 & -1 & 1 \\ 0 & -2 & 3 & 1 \\ 0 & 1 & -\frac{3}{2} & \frac{1}{2} \end{bmatrix} \qquad 2R_2 \rightarrow R_2 - R_1$$

$$= \begin{matrix} 2 & -4 & -1 & 1 \\ 0 & 1 & -\frac{3}{2} & -\frac{1}{2} \\ 0 & 0 & 0 & 0 \end{matrix} \qquad -\frac{1}{2}R_2 \rightarrow R_3 - R_2$$