

P2) Choose  $h, k$  such that has given proportions

$$x_1 + 3x_2 = 2$$

$$3x_1 + h x_2 = k$$

a) no solution

-this will occur when eq's are //

-we are going to set the coefficients to be equal ratios of each other but not the result

like this

$$x_1 + 3x_2 = 2$$

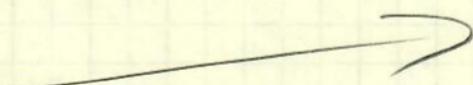
$$3x_1 + 3 \cdot 3x_2 = 0$$

again w/ the eliminable notion

$$\left[ \begin{array}{cc|c} 1 & 3 & 2 \\ 3 & 9 & 0 \end{array} \right] \Rightarrow r_1 = r_1 \quad \left[ \begin{array}{cc|c} 1 & 3 & 2 \\ 0 & 0 & -6 \end{array} \right]$$

$0 \neq -6$  thus no

else  $h=9$  and  $k=0$  works! solution



P2) Continued on -

b) a unique solution

- this occurs when eq's cross

- let's pick a couple easy numbers  
to calculate.

$$x_1 + 3x_2 = 2$$

$$3x_1 + 3x_2 = 0$$

$$\left[ \begin{array}{cc|c} 1 & 3 & 2 \\ 3 & 3 & 0 \end{array} \right] \Rightarrow \begin{array}{l} r_1 = r_1 \\ r_3 = r_3 - 3r_1 \end{array} \left[ \begin{array}{cc|c} 1 & 3 & 2 \\ 0 & -6 & -6 \end{array} \right]$$

$$\Rightarrow \begin{array}{l} r_1 = r_1 \\ r_3 = \frac{r_3}{-6} \end{array} \left[ \begin{array}{cc|c} 1 & 3 & 2 \\ 0 & 1 & 1 \end{array} \right]$$

$$\Rightarrow r_1 = r_1 - 3r_2 \left[ \begin{array}{cc|c} 1 & 0 & -1 \\ 0 & 1 & 1 \end{array} \right]$$

$$(x_1, x_2) = (-1, 1)$$

is indeed a unique solution



P2 continued ...

i) many solutions

- this will happen when eq's are on top of each other
- we can cook up some values that work by making the coeff and result have equal ratios, i.e. so...

$$x_1 + 3x_2 = 2$$

$$3x_1 + 3x_2 = 2 \cdot 3$$

again w/ augmented matrix reduction

$$\left[ \begin{array}{ccc|c} 1 & 3 & 2 \\ 3 & 9 & 6 \end{array} \right] \Rightarrow \begin{array}{l} r_1=r_1 \\ r_2=r_2-3r_1 \end{array} \left[ \begin{array}{ccc|c} 1 & 3 & 2 \\ 0 & 0 & 0 \end{array} \right]$$

$x_1 + 3x_2 = 2$  is one solution

