Linear algebra HW

1. $\left[\begin{array}{ccc|c} a_{11} & \cdots & & x_1 \\ a_{21} & \cdots & & \vdots \\ \vdots & & & \vdots \\ a_{n1} & \cdots & & x_n \end{array}\right] = \left[\begin{array}{c|c} R_1 & x_1 \\ R_2 & \vdots \\ \vdots & \vdots \\ R_n & x_n \end{array}\right]$

~~$R_n + R_x$~~

$\left[\begin{array}{c|c} R_1 & x_1 \\ \vdots & \vdots \\ R_x & x_x \\ \vdots & \vdots \\ R_n + R_x & x_n \end{array}\right]$ ← i?

$a_{11}x_1 + \cdots a_{1n}x_n = b_1$

$a_{21}x_1 + \cdots a_{2n}x_n = b_2$

$\vdots$

$a_{x1}x_1 + \cdots a_{xn}x_n + a_{i1}x_1 + \cdots a_{in}x_n$

original = bx ; = bi

$= \boxed{bx + bi}$

2. $\left[\begin{array}{ccc|c} 1 & -2 & 4 & 12 \\ 2 & 1 & -1 & 4 \end{array}\right]$

(1)

(2) $4x + 2y - 2z = 8$

(3) $2x + y - z = 4$

(4) $x + 2z = 4$

$x = 4$

$y = -4$

$z = 0$

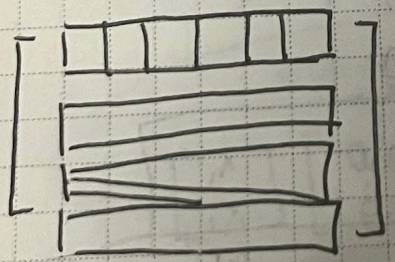
$\left[\begin{array}{ccc|c} 4 & -2 & 4 & 8 \\ 2 & 1 & -1 & 4 \\ 1 & 0 & 2 & 4 \end{array}\right]$

$x_1\begin{bmatrix} a \\ b \\ c \\ d \end{bmatrix} + x_2\begin{bmatrix} \\ \\ \\ \end{bmatrix} + \cdots = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$

if determinant = 0, ~~not~~ linear indepen

↓ if they all get squised onto a ~~plane~~ lower dimension.

3.

① 

② sometimes?

③ never?

④ sometimes

⑤ sometimes

⑥ sometimes

or 4 equations

$ax_1 + bx_2 + \ldots =$

~~sometimes?~~ never

6 unknowns

7. $\begin{bmatrix}1\\0\\1\end{bmatrix} = x\begin{bmatrix}5\\-1\\2\end{bmatrix} + y\begin{bmatrix}2\\0\\1\end{bmatrix} + z\begin{bmatrix}1\\-1\\1\end{bmatrix}$

$x = -0.5$

$y = 1.5$

$z = 0.5$

8.

A: 10 m/s 5 kg

B 15 m/s 3 kg

100 m

25 kg

$15x + 10y = 100$

~~$5x + 3y = 25$~~

~~$3A + 5B = 25$~~

$B = 5$

~~$y = 25$~~

~~$15x + 9y = 75$~~

$15x + 25y = 125$

$5y = 25$

$y = 5$

$\begin{bmatrix} 10 & 15 & | & 100 \\ 15 & 5 & | & 25 \end{bmatrix}$

5 3

~~$2A + \ldots$~~

$A = 5, B = 3$

$B = 5$

$2 \cdot 5 + 5 \cdot 3 = 25$

$(10A + 15B)T = 100$

$75T = 100$

$B = 5$ 5 drones

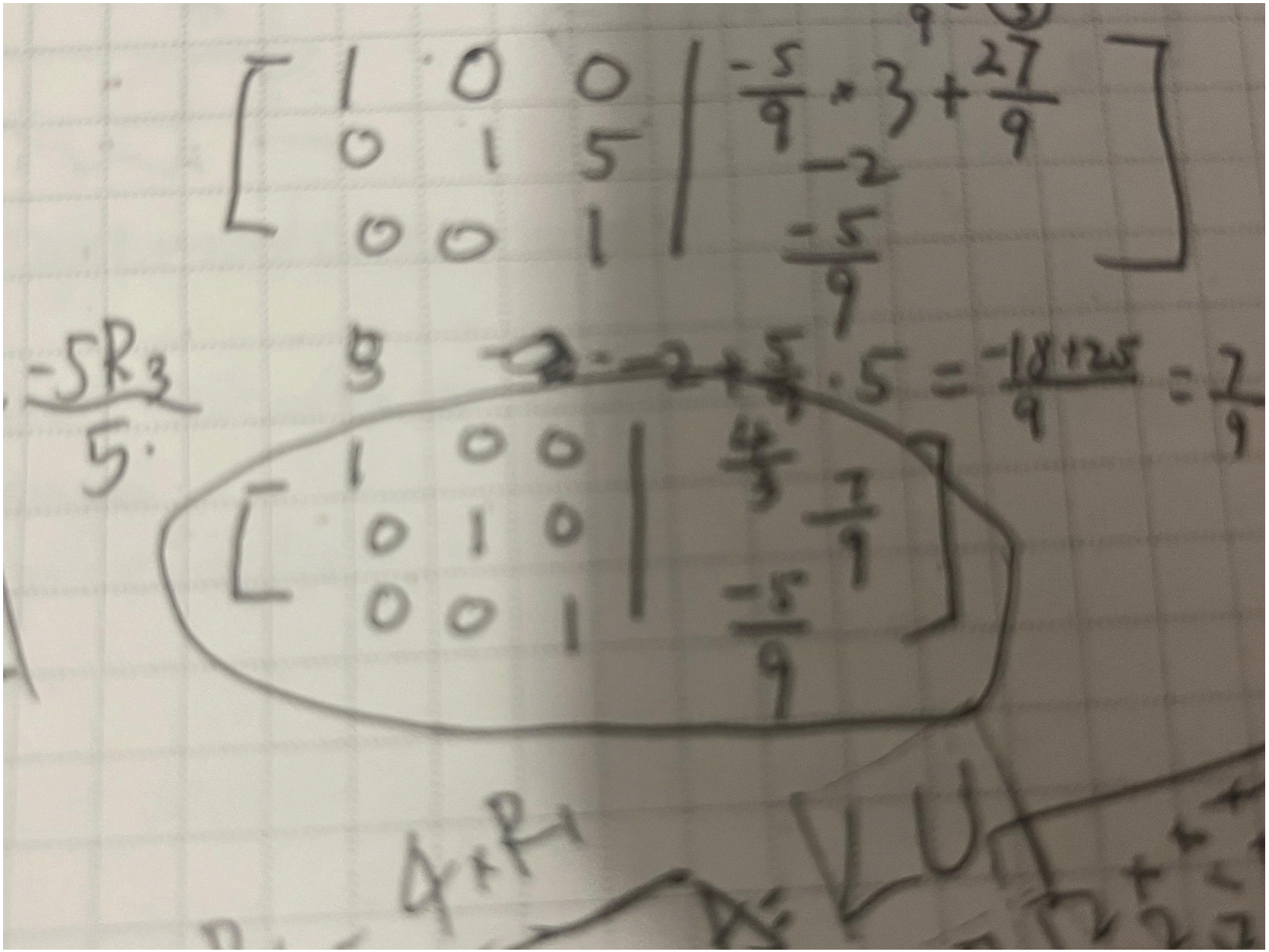
20

~~$10 m/s \cdot 2 \cdot t$~~

$+ 15 m/s \cdot 3t = 100$

45

$65t = 100$


$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 5 \\ 0 & 0 & 1 \end{bmatrix}$
$\begin{bmatrix} -\frac{5}{9} \\ -2 \\ -\frac{5}{9} \end{bmatrix}$
$\begin{bmatrix} -\frac{5}{9} \\ 3 \\ \frac{27}{9} \end{bmatrix}$
$-5R_3$
$5\cdot$
$-2 - 2 + 5 \cdot 5 = \frac{-18+25}{9} = \frac{7}{9}$
$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
$\begin{bmatrix} \frac{4}{3} \\ \frac{7}{9} \\ -\frac{5}{9} \end{bmatrix}$
$A = LU$