

MTH-102

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Linear Algebra. (LA)

Ordinary differential  
Equation.  
(ODE)

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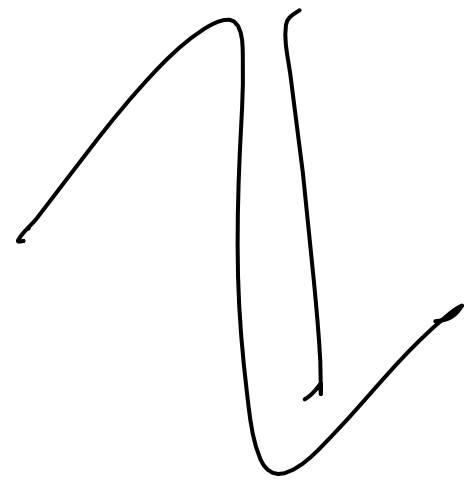
Quarz-1-	20'
Middlum -	60
Quarz-2 -	20
Endlum -	186

a

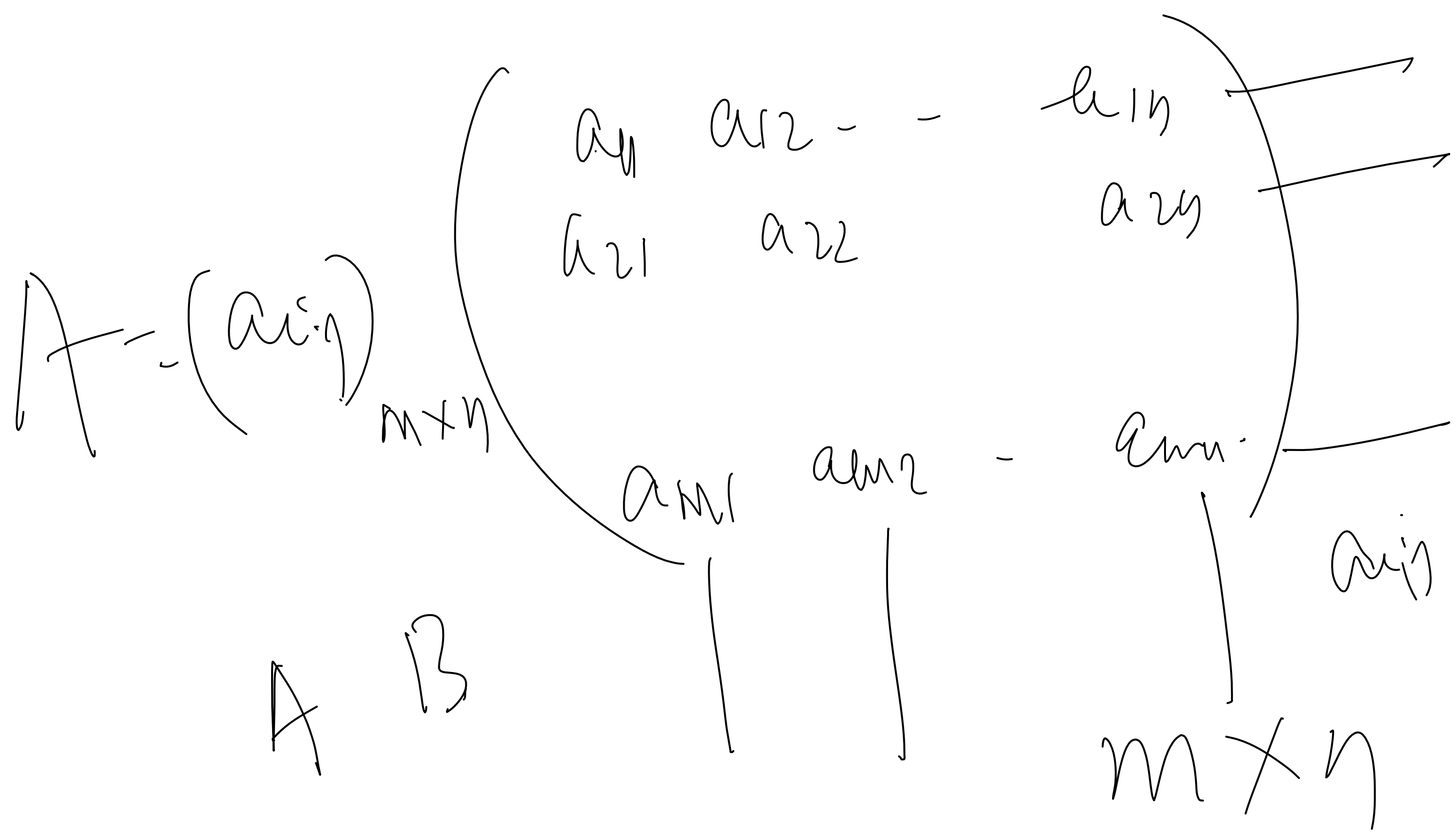
$\mathbb{R} = \{1, 2, 3, \dots\}$   
 $\mathbb{Q} \cup \mathbb{Q}'$

$\mathbb{C} = \{a + bi, a - bi\}$   
 $\mathbb{R} = \{0, 1, 2, \dots\}$   
 $\mathbb{Q} = \{p/q, q \in \mathbb{Z}, q \neq 0\}$

$$a \in \mathbb{N}$$



$$\mathbb{C} \left\{ a^2 + 1 \leq 0, a, b \in \mathbb{R} \right\}$$





$$A_{2 \times 3} = \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{pmatrix} \quad 2 \times 3$$

$$C = \begin{pmatrix} a_{11} & b_{11} & a_{12} & b_{12} & a_{13} & b_{13} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \end{pmatrix}$$



$$A_{m \times n} \quad B_{m \times n}$$

$$C =$$

$$\alpha A =$$

$$\begin{pmatrix} \alpha a_{11} & \alpha a_{12} & \dots & \alpha a_{1n} \\ \alpha a_{21} & \alpha a_{22} & \dots & \alpha a_{2n} \\ \dots & \dots & \dots & \dots \\ \alpha a_{m1} & \alpha a_{m2} & \dots & \alpha a_{mn} \end{pmatrix}$$

$$A = (a_{ij})_{m \times n}$$

$$B = (b_{ij})_{n \times k}$$

$$C = (c_{ij})_{n \times k} \text{ aik basis}$$

$c_{ij} = \dots$

$$A + B = 0$$

$$C_{11} = \sum_{k=1}^n a_{1k} b_k$$

$$= a_{11} b_{11} + a_{12} b_{21} + \dots$$

$A + B = B + A$   
 $A + (B + C) = (A + B) + C$

$$(AB)C = A(BC)$$

$$AB = BA \quad ?$$

$$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} C & 1 \\ 0 & 0 \end{pmatrix} = B$$

$$A(B + C)$$

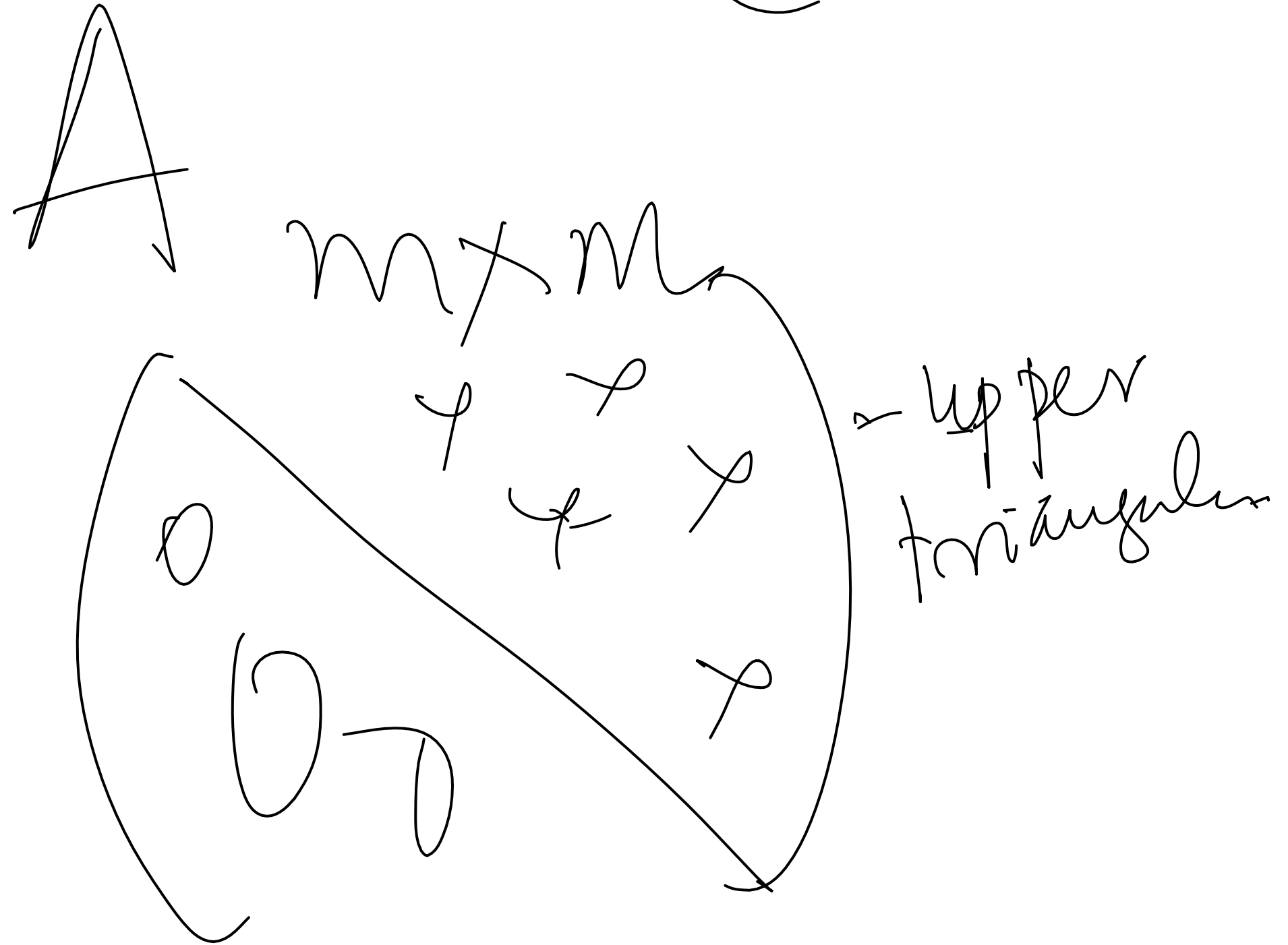
$$= AB + AC$$

$$B = (A^T)^T = A$$

$$A_{m \times n}$$

$$B = (b_{ij})$$

$b_{ij} = a_{ji}$





$$ax + by = c$$

$$a, b, c \in \mathbb{Z}$$

$$a_1x + b_1y + c_1z = d_1$$

$$a_2x + b_2y + c_2z = d_2$$

$$a_1x + b_1y = c_1$$

$$a_2x + b_2y = c_2$$

$$x + y = 3$$

$$2x + y = 3$$

$$x + y = 3$$

$$2x + 3y = 4$$



$$a_{11}x_1 + a_{12}x_2 + \dots + a_{1n}x_n = d_1$$

$$a_{21}x_1 + a_{22}x_2 + \dots + a_{2n}x_n = d_2$$

⋮

⋮

$$a_{m1}x_1 + a_{m2}x_2 + \dots + a_{mn}x_n = d_m$$

$$AX = d$$

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{pmatrix}$$

$$X = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}$$

$$d = \begin{pmatrix} d_1 \\ d_2 \\ \vdots \\ d_n \end{pmatrix}$$

$$(1) \quad AX = d$$

$$(2) \quad BX = c$$

(1) and (2) are  
equivalent if  
every equation in (1)  
is a linear combination  
of equations of (2)  
and vice versa