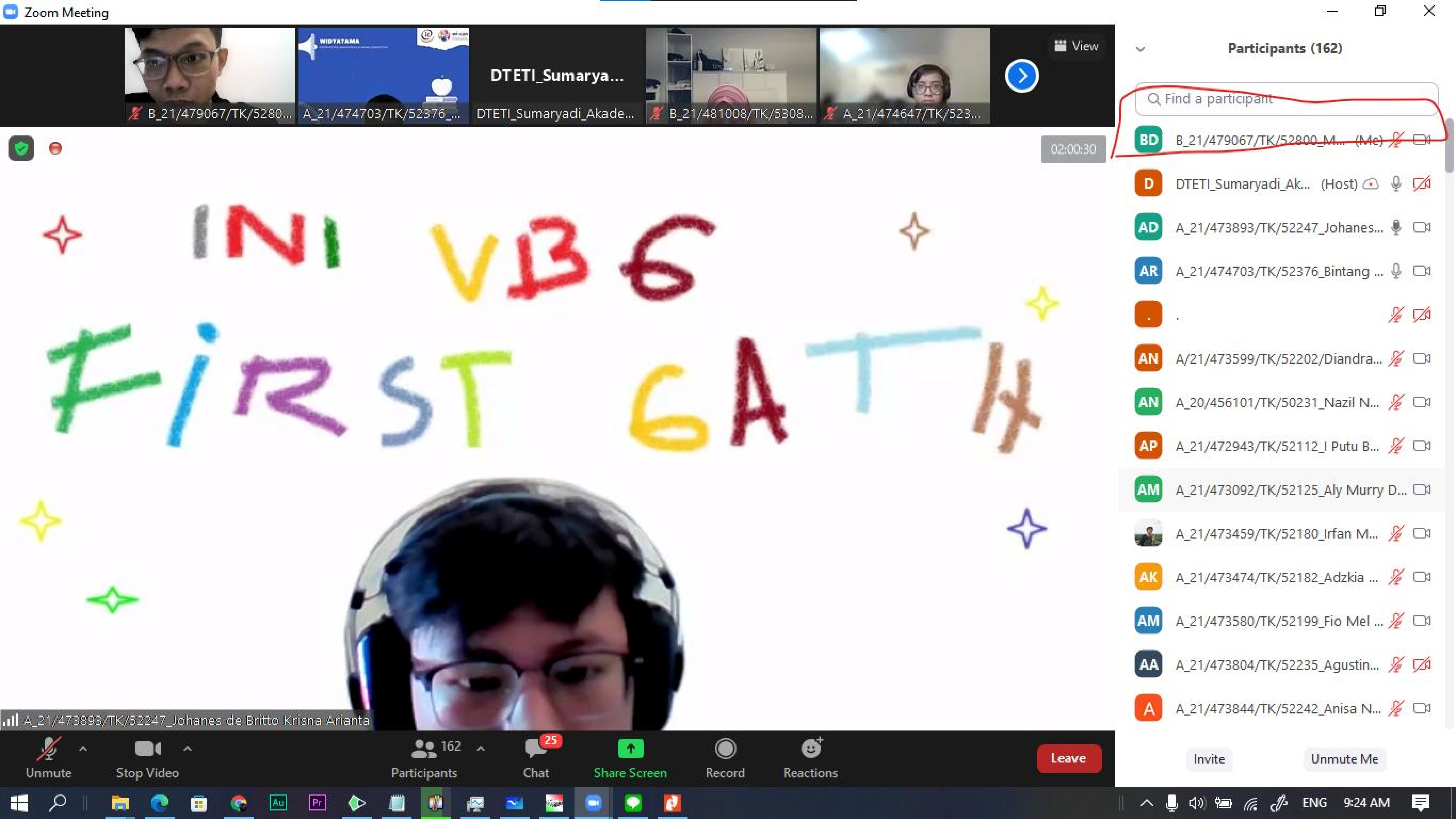
Zoom Meeting
B_21/479067/TK/5280...
A_21/474703/TK/52376_...
DTETI_Sumarya...
DTETI_Sumaryadi_Akade...
B_21/481008/TK/5308...
A_21/474647/TK/523...
View
02:00:30
INI VB6
FIRST GATH
A_21/473893/TK/52247_Johanes de Britto Krisna Arianta
Participants (162)
Find a participant
BD B_21/479067/TK/52800_M... (Me)
D DTETI_Sumaryadi_Ak... (Host)
AD A_21/473893/TK/52247_Johanes...
AR A_21/474703/TK/52376_Bintang ...
AN A/21/473599/TK/52202/Diandra...
AN A_20/456101/TK/50231_Nazil N...
AP A_21/472943/TK/52112_I Putu B...
AM A_21/473092/TK/52125_Aly Murry D...
A_21/473459/TK/52180_Irfan M...
AK A_21/473474/TK/52182_Adzkia ...
AM A_21/473580/TK/52199_Fio Mel ...
AA A_21/473804/TK/52235_Agustin...
A A_21/473844/TK/52242_Anisa N...
Unmute
Stop Video
162
Participants
25
Chat
Share Screen
Record
Reactions
Leave
Invite
Unmute Me
ENG
9:24 AM

Muchammad Daniyal Kautsar
21/479067/TK/52800

UTS TVM

Pakta Integritas

"Saya yang bertanda tangan dibawah ini, secara sadar dan sungguh-sungguh akan mengerjakan soal Ujian Tengah Semester Teori Vektor dan Matriks, tidak bertanya, berdiskusi, dan bekerja sama dengan teman/orang lain, tidak mencari pertolongan dengan cara, media dan bentuk apapun, dan tidak akan saling membagi jawaban selama masa ujian berlangsung. Bila saya melanggar, saya siap menerima konsekuensi berupa UTS saya tidak akan dinilai sama sekali dan dianggap bernilai NOL."

Sleman, 14 Desember 2021

Muchammad Daniyal Kautsar

0. variable initiation

NIU = 479067
NIF = 52800

$\beta_1 = 1 + (7+5) \bmod 6 = 1 + 0 = 1$

$\beta_2 = 1 + (9+2) \bmod 6 = 1+5 = 6$

$\beta_3 = 1 + (0+8) \bmod 6 = 1+2 = 3$

$\beta_4 = 1 + (6+0) \bmod 6 = 1+0 = 1$

$\beta_5 = 1 + (7+0) \bmod 6 = 1+1 = 2$

1.

$$\begin{aligned} \beta_3 x + 2\beta_3 y &= 5\beta_3 \\ 3\beta_5 x + 2\beta_5 y &= 11\beta_5 \end{aligned} \Rightarrow \begin{aligned} 3x + 6y &= 15 \\ 6x + 4y &= 22 \end{aligned}$$

a. Matrix multiplication

$$\begin{aligned} 3x + 6y &= 15 \\ 6x + 4y &= 22 \end{aligned} \Rightarrow \begin{bmatrix} 3 & 6 \\ 6 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 15 \\ 22 \end{bmatrix}$$

b. Find the solution !

$$\begin{bmatrix} 3 & 6 \\ 6 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 15 \\ 22 \end{bmatrix}$$

* Using elimination, ~~we try~~ I will use the non matrix notation.

$3x + 6y = 15$

$6x + 4y = 22$ . Eliminating both value of $x$ and $y$. Thus,

* $$\begin{array}{r} 3x + 6y = 15 \\ 3x + 2y = 11 \\ \hline 4y = 4 \\ y = 1 \end{array} -$$

* $3x + 6y = 15$

$3x + 6(1) = 15$

$3x = 15 - 6$

$3x = 9$

$x = 3$

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$ . So, the value of $x = 3$ and $y = 1$.

c. Draw column Picture

5. solving $Ax = b$

$$v_1 = \begin{bmatrix} 1\beta_2 \\ 4\beta_2 \\ 2\beta_2 \\ 2\beta_2 \end{bmatrix} = \begin{bmatrix} 6 \\ 24 \\ 12 \\ 12 \end{bmatrix}, \quad v_2 = \begin{bmatrix} -2\beta_1 \\ 5\beta_1 \\ 1\beta_1 \\ 4\beta_1 \end{bmatrix} = \begin{bmatrix} -2 \\ 5 \\ 1 \\ 4 \end{bmatrix}, \quad v_3 = \begin{bmatrix} 1\beta_3 \\ -3\beta_3 \\ -3\beta_3 \\ -2\beta_3 \end{bmatrix} = \begin{bmatrix} 3 \\ -9 \\ -9 \\ -6 \end{bmatrix}$$

$$v_4 = \begin{bmatrix} 2\beta_4 \\ -2\beta_4 \\ 3\beta_4 \\ 2\beta_4 \end{bmatrix} = \begin{bmatrix} 2 \\ -2 \\ 3 \\ 2 \end{bmatrix}, \quad v_5 = \begin{bmatrix} 7\beta_1 \\ 3\beta_4 \\ -2\beta_3 \\ 4\beta_2 \end{bmatrix} = \begin{bmatrix} 14 \\ 3 \\ -6 \\ 24 \end{bmatrix}$$

$$A = [v_1, v_2, v_3, v_4] \qquad b = v_5$$

$$A = \begin{bmatrix} 6 & -2 & 3 & 2 \\ 24 & 5 & -9 & -2 \\ 12 & 1 & -9 & 3 \\ 12 & 4 & -6 & 2 \end{bmatrix} \qquad b = \begin{bmatrix} 14 \\ 3 \\ -6 \\ 24 \end{bmatrix}$$

a) Gaur elimination

Augmented matrix representation

$$\left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 24 & 5 & -9 & -2 & 3 \\ 12 & 1 & -9 & 3 & -6 \\ 12 & 4 & -6 & 2 & 24 \end{array}\right].$$

$$* \; \underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -2 & 0 & 0 & 1 \end{bmatrix}}_{E_{41}} \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 24 & 5 & -9 & -2 & 3 \\ 12 & 1 & -9 & 3 & -6 \\ 12 & 4 & -6 & 2 & 24 \end{array}\right]$$

$$= \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 24 & 5 & -9 & -2 & 3 \\ 12 & 1 & -9 & 3 & -6 \\ 0 & 8 & -12 & -2 & -4 \end{array}\right]$$

$$* \; \underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}}_{E_{31}} \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 24 & 5 & -9 & -2 & 3 \\ 12 & 1 & -9 & 3 & -6 \\ 0 & 8 & -12 & -2 & -4 \end{array}\right] = \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 24 & 5 & -9 & -2 & 3 \\ 0 & 5 & -15 & -1 & -34 \\ 0 & 8 & -12 & -2 & -4 \end{array}\right]$$

$$* \; \underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 \\ -4 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}}_{E_{21}} \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 24 & 5 & -9 & -2 & 3 \\ 0 & 5 & -15 & -1 & -34 \\ 0 & 8 & -12 & -2 & -4 \end{array}\right] = \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 0 & 13 & -21 & -10 & -53 \\ 0 & 5 & -15 & -1 & -34 \\ 0 & 8 & -12 & -2 & -4 \end{array}\right]$$

$$\underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & -\frac{8}{13} & 0 & 1 \end{bmatrix}}_{E_{42}} \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 0 & 13 & -21 & -10 & -53 \\ 0 & 5 & -15 & -1 & -34 \\ 0 & 8 & -12 & -2 & -4 \end{array}\right] = \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 0 & 13 & -21 & -10 & -53 \\ 0 & 5 & -15 & -1 & -34 \\ 0 & 0 & 12/13 & 54/13 & 372/13 \end{array}\right]$$

$$\underbrace{\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -5/13 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}}_{E_{32}} \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 0 & 13 & -21 & -10 & -53 \\ 0 & 5 & -15 & -1 & -34 \\ 0 & 0 & 12/13 & 54/13 & 372/13 \end{array}\right] = \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 0 & 13 & -21 & -10 & -53 \\ 0 & 0 & -90/13 & 37/13 & -173/13 \\ 0 & 0 & 12/13 & 54/13 & 372/13 \end{array}\right]$$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & \frac{2}{15} & 1 \end{bmatrix} \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 0 & 13 & -21 & -10 & -53 \\ 0 & 0 & -90/13 & 37/13 & -173/13 \\ 0 & 0 & 12/13 & 54/13 & 372/13 \end{array}\right] = \left[\begin{array}{cccc|c} 6 & -2 & 3 & 2 & 14 \\ 0 & 13 & -21 & -10 & -53 \\ 0 & 0 & -90/13 & 37/13 & -173/13 \\ 0 & 0 & 0 & 68/15 & 134/5 \end{array}\right]$$

$$6x_1 - 2x_2 + 3x_3 + 2x_4 = 14$$
$$13x_2 - 21x_3 - 10x_4 = -53$$
$$-90/13\, x_3 + 37/13\, x_4 = -173/13$$
$$68/15\, x_4 = 134/5$$

$$x_4 = \frac{134}{5} \cdot \frac{15}{68} = \frac{201}{34}$$

$$\frac{-90}{13} x_3 + \frac{37}{13} \cdot \frac{201}{34} = \frac{-173}{13}$$

$$x_3 = \frac{299}{68}$$

$$13x_2 - 21 \cdot \frac{299}{68} - 10 \cdot \frac{201}{34} = -53$$

$$x_2 = \frac{515}{68}$$

$$6x_1 - 2 \cdot \frac{515}{68} + 3 \cdot \frac{299}{68} + 2 \cdot \frac{201}{34} = 14$$

$$x_1 = \frac{281}{408}$$

Therefore, $x_1 = \frac{281}{408}$, $x_2 = \frac{515}{68}$, $x_3 = \frac{299}{68}$, $x_4 = \frac{201}{34}$

$$E_{41} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ -2 & 0 & 0 & 1 \end{bmatrix}, \quad E_{41}^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 2 & 0 & 0 & 1 \end{bmatrix}$$

$$E_{31} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ -2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \quad E_{31}^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 2 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$E_{21} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ -4 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \quad E_{21}^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 4 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$E_{42} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & -\frac{8}{13} & 0 & 1 \end{bmatrix}, \quad E_{42}^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & \frac{8}{13} & 0 & 1 \end{bmatrix}$$

$$\cancel{E} \; E_{32} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -5/13 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \quad E_{32}^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 5/13 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$E_{43} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & \frac{2}{15} & 1 \end{bmatrix}, \quad E_{43}^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & -\frac{2}{15} & 1 \end{bmatrix}$$

b. Solve using $A = LU$

since $A = LU$

$A = E^{-1}U$, where $E^{-1}$ is already calculate from question A.

$$E^{-1} = E_{21}^{-1} E_{31}^{-1} E_{41}^{-1} E_{32}^{-1} E_{42}^{-1} E_{43}^{-1}$$

$$E^{-1} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ -4 & 1 & 0 & 0 \\ -2 & -5/13 & 1 & 0 \\ -2 & -8/13 & 2/15 & 1 \end{bmatrix} = L$$

and
$$U = \begin{bmatrix} 6 & -2 & 3 & 2 \\ 0 & 13 & -21 & -10 \\ 0 & 0 & -40/13 & 37/13 \\ 0 & 0 & 0 & 68/15 \end{bmatrix}$$

, $U_3$

* $Lc = b$

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ -4 & 1 & 0 & 0 \\ -2 & -5/13 & 1 & 0 \\ -2 & -8/13 & 2/15 & 1 \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{bmatrix} = \begin{bmatrix} 14 \\ 3 \\ -6 \\ 24 \end{bmatrix}$$

* $c_1 = 14$
* $-4c_1 + c_2 = 13 \rightarrow -4 \cdot 14 + c_2 = 13 \rightarrow c_2 = 69$
* $-2c_1 - \frac{5}{13} c_2 + c_3 = -6 \rightarrow -2 \cdot 14 - \frac{5}{13} \cdot 69 + c_3 = -6 \rightarrow c_3 = \frac{631}{13}$
* $-2c_1 - \frac{8}{13} c_2 + \frac{2}{15} c_3 + c_4 = 24 \rightarrow c_4 = \frac{16183}{195}$

* $Ux = c$

$$\begin{bmatrix} 6 & -2 & 3 & 2 \\ 0 & 17 & -21 & -10 \\ 0 & 0 & -90/13 & 37/13 \\ 0 & 0 & 0 & 68/15 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} \\ \\ \\ \\ \end{bmatrix}$$