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Course code: EIN6382

### Assignment 3

$$T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 = 4$$

$$2T_1 - T_2 + T_3 + 2T_4 + T_5 - 3T_6 = 20$$

$$T_1 + 3T_2 - 3T_3 - T_4 + 2T_5 + T_6 = -15$$

$$5T_1 + 2T_2 - T_3 - T_4 + 2T_5 + T_6 = -3$$

$$-3T_1 - T_2 + 2T_3 + 3T_4 + T_5 + 3T_6 = 16$$

$$4T_1 + 3T_2 + T_3 - 6T_4 - 3T_5 - 2T_6 = -27$$

Solution

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 2 & -1 & 1 & 2 & 1 & -3 \\ 1 & 3 & -3 & -1 & 2 & 1 \\ 5 & 2 & -1 & -1 & 2 & 1 \\ -3 & -1 & 2 & 3 & 1 & 3 \\ 4 & 3 & 1 & -6 & -3 & -2 \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 20 \\ -15 \\ -3 \\ 16 \\ -27 \end{bmatrix}$$

$$f_1 = \frac{2}{1} = 2$$

$$f_2 = \frac{1}{1} = 1$$

$$f_3 = \frac{5}{1} = 5$$

$$f_4 = \frac{-3}{1} = -3$$

$$f_5 = \frac{4}{1} = 4$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 2-2(1) & -1-2(1) & 1-2(-2) & 2-2(1) & 1-2(3) & -3-2(-1) \\ 1-1(1) & 3-1(1) & -3-1(-2) & -1-1(1) & 2-1(3) & 1-1(-1) \\ 5-5(1) & 2-5(1) & -1-5(-2) & -1-5(1) & 2-5(3) & 1-5(-1) \\ -3+3(1) & -1+3(1) & 2+3(-2) & 3+3(1) & 1+3(3) & 3+3(-1) \\ 4-4(1) & 3-4(1) & 1-4(-2) & -6-4(1) & -3-4(3) & -2-4(-1) \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 20-2(4) \\ -15-1(4) \\ -3-5(4) \\ 16+3(4) \\ -27-4(4) \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 2 & -1 & -2 & -1 & 2 \\ 0 & -3 & 9 & -6 & -13 & 6 \\ 0 & 2 & -4 & 6 & 10 & 0 \\ 0 & -1 & 9 & 10 & -15 & 2 \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -19 \\ -23 \\ 28 \\ -43 \end{matrix}$$

$$f_1 = -2/3$$

$$f_2 = -3/3 = -1$$

$$f_3 = -2/3$$

$$f_4 = -1/3 = 1/3$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 2 + \frac{2}{3}(-3) & -1 + \frac{2}{3}(5) & -2 + \frac{2}{3}(1) & -1 + \frac{2}{3}(-5) & 2 + \frac{2}{3}(-1) \\ 0 & -3 - 1(-3) & 9 - 1(5) & -6 - 1(0) & -13 - 1(-5) & 6 - 1(-1) \\ 0 & 2 + \frac{2}{3}(-3) & 4 + \frac{2}{3}(5) & 6 + \frac{2}{3}(1) & 10 + \frac{2}{3}(-5) & 0 + \frac{2}{3}(1) \\ 0 & -1 - \frac{1}{3}(-3) & 9 - \frac{1}{3}(5) & -10 - \frac{1}{3}(1) & -15 - \frac{1}{3}(-5) & 2 - \frac{1}{3}(-1) \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -19 + \frac{2}{3}(12) \\ -23 - 1(12) \\ 28 + \frac{2}{3}(12) \\ -43 - \frac{1}{3}(12) \end{matrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & \frac{7}{3} & -2 & -\frac{13}{3} & \frac{4}{3} \\ 0 & 0 & 4 & -6 & -8 & 7 \\ 0 & 0 & -\frac{2}{3} & 6 & \frac{20}{3} & -\frac{2}{3} \\ 0 & 0 & \frac{22}{3} & -10 & -\frac{40}{3} & \frac{7}{3} \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -11 \\ -35 \\ 36 \\ -47 \end{matrix}$$

$$f_1 = \frac{4 \times 3}{7} = \frac{12}{7}$$

$$f_2 = \frac{-2 \times 3}{3 \times 7} = -\frac{2}{7}$$

$$f_3 = \frac{22 \times 3}{3 \times 7} = \frac{22}{7}$$

~~f\_4~~

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & \frac{7}{3} & -2 & -\frac{13}{3} & \frac{4}{3} \\ 0 & 0 & 4 - \frac{12}{7}(\frac{7}{3}) & -6 - \frac{12}{7}(-2) & -8 - \frac{12}{7}(-\frac{13}{3}) & 7 - \frac{12}{7}(\frac{4}{3}) \\ 0 & 0 & -\frac{2}{3} + \frac{2}{7}(\frac{7}{3}) & 6 + \frac{2}{7}(-2) & \frac{20}{3} + \frac{2}{7}(-\frac{13}{3}) & -\frac{2}{3} + \frac{2}{7}(\frac{4}{3}) \\ 0 & 0 & \frac{22}{3} - \frac{22}{7}(\frac{7}{3}) & -10 - \frac{22}{7}(-2) & -\frac{40}{3} - \frac{22}{7}(-\frac{13}{3}) & \frac{7}{3} - \frac{22}{7}(\frac{4}{3}) \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -11 \\ -35 - \frac{12}{7}(-11) \\ 36 + \frac{2}{7}(-11) \\ -47 - \frac{22}{7}(-11) \end{matrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & \frac{7}{3} & -2 & -\frac{13}{3} & \frac{4}{3} \\ 0 & 0 & 0 & -\frac{18}{7} & -\frac{4}{7} & \frac{33}{7} \\ 0 & 0 & 0 & \frac{38}{7} & \frac{38}{7} & -\frac{2}{7} \\ 0 & 0 & 0 & -\frac{26}{7} & \frac{2}{7} & -\frac{13}{7} \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -11 \\ -\frac{113}{7} \\ \frac{230}{7} \\ -\frac{87}{7} \end{matrix}$$

$$f_1 = \frac{-38 \times 7}{7 \times 18} = \frac{-19}{9} \quad f_2 = \frac{+26 \times 7}{7 \times 18} = \frac{13}{9}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & \frac{7}{3} & -2 & -\frac{13}{3} & \frac{4}{3} \\ 0 & 0 & 0 & -\frac{18}{7} & -\frac{4}{7} & \frac{33}{7} \\ 0 & 0 & 0 & \frac{38}{7} + \frac{14}{9}(-\frac{18}{7}) & \frac{38}{7} + \frac{14}{9}(-\frac{4}{7}) & -\frac{2}{7} + \frac{14}{9}(\frac{33}{7}) \\ 0 & 0 & 0 & -\frac{26}{7} - \frac{13}{9}(-\frac{18}{7}) & \frac{2}{7} - \frac{13}{9}(-\frac{4}{7}) & -\frac{13}{7} - \frac{13}{9}(\frac{33}{7}) \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -11 \\ -\frac{113}{7} \\ \frac{230}{7} + \frac{14}{9}(-\frac{113}{7}) \\ -\frac{87}{7} - \frac{13}{9}(-\frac{113}{7}) \end{matrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & \frac{7}{3} & -2 & -\frac{13}{3} & \frac{4}{3} \\ 0 & 0 & 0 & -\frac{18}{7} & -\frac{4}{7} & \frac{33}{7} \\ 0 & 0 & 0 & 0 & \frac{38}{9} & \frac{29}{3} \\ 0 & 0 & 0 & 0 & \frac{10}{9} & -\frac{26}{3} \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{matrix} = \begin{matrix} 4 \\ 12 \\ -11 \\ -\frac{113}{7} \\ -\frac{11}{9} \\ \frac{98}{9} \end{matrix}$$

$$f_1 = \frac{10 \times 9}{9 \times 38} = \frac{5}{19}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 \\ 0 & 0 & 0 & 0 & 38/9 & 29/3 \\ 0 & 0 & 0 & 0 & 10/9 - 5/19(38/9) & -26/3 - 5/19(29/3) \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \\ T_6 \end{matrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -113/7 \\ -11/9 \\ 98/9 - 5/19(-11/9) \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 0 & -3 & 5 & 0 & -5 & -1 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 \\ 0 & 0 & 0 & 0 & 38/9 & 29/3 \\ 0 & 0 & 0 & 0 & 0 & -213/19 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{matrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \\ T_6 \end{matrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -113/7 \\ -11/9 \\ 213/19 \\ 0 \end{bmatrix}$$

$$-213/19 T_6 = 213/19$$

$$T_6 = \frac{213}{19} \times \frac{-19}{213} = -1$$

$$38/9 T_5 + 29/3 T_6 = -11/9$$

$$38/9 T_5 + 29/3(-1) = -11/9$$

$$T_5 = \left( \frac{-11}{9} + \frac{29}{3} \right) \times \frac{9}{38}$$

$$= 2$$

$$-18/7 T_4 - 4/7 T_5 + 33/7 T_6 = -113/7$$

$$-18/7 T_4 - 4/7 (2) + 33/7 (-1) = -113/7$$

$$-18/7 T_4 - 8/7 - 33/7 = -113/7$$

$$T_4 = \left( \frac{-113 + 8 + 33}{7} \right) \times \frac{7}{18} = 4$$

$$7/3 T_3 - 2T_4 - 13/3 T_5 + 4/3 T_6 = -11$$

$$7/3 T_3 - 2(4) - 13/3 (2) + 4/3 (-1) = -11$$

$$7/3 T_3 - 8 - 26/3 - 4/3 = -11$$

$$T_3 = \frac{(-11 + 8 + 26/3 + 4/3) \times 3/7}{1} = 3$$

$$-3T_2 + 5T_3 + 0T_4 - 5T_5 - T_6 = 12$$

$$-3T_2 + 5(3) - 5(2) + 1 = 12$$

$$T_2 = \frac{12 - 15 + 10 - 1}{-3} = -2$$

$$T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 = 4$$

$$T_1 - 2 - 2(3) + 4 + 3(2) + 1 = 4$$

$$T_1 - 2 - 6 + 4 + 6 + 1 = 4$$

$$T_1 = 4 + 2 + 6 - 4 - 6 - 1$$

$$= 1$$

$$T_1 = 1$$

$$T_2 = -2$$

$$T_3 = 3$$

$$T_4 = 4$$

$$T_5 = 2$$

$$T_6 = -1$$