

03

SATURDAY
WK 05 DAY 034-332FEBRUARY
2024SUNDAY
2024
FEBRUARY

03

SUNDAY
DAY 035-331 WK 05

04

$$09 \quad 9x_1 + 3x_2 + 4x_3 = 7$$

$$10 \quad 9x_1 + 3(4) + 4\left(\frac{-4}{5}\right) = 7$$

$$11 \quad \boxed{x_1 = -\frac{1}{5}}$$

$$12 \quad \boxed{x_1 = -\frac{1}{5}},$$

* Completing pivoting - another method to solve linear eq's.

$$1 \quad x_1 + x_2 + x_3 = 3$$

$$2 \quad 4x_1 + 3x_2 + 4x_3 = 8$$

$$3 \quad 6x_1 + 3x_2 + 14x_3 = 7$$

$$4 \quad 6x_1 + 3x_2 + 14x_3 = 7$$

$$5 \quad [A:B] = \begin{bmatrix} 1 & 1 & 1 & : & 3 \\ 4 & 3 & 4 & : & 8 \\ 9 & 3 & 14 & : & 7 \end{bmatrix}$$

$$6 \quad \text{Row op.}$$

$$7 \quad \text{Row op.}$$

Step 1: A me shay bada element a_{11} pe karva karun

(multiples of largest element)

\Leftrightarrow

$| -1 | = +1 \rightarrow \text{highest}$
repeat step 1.

\Leftrightarrow

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\Leftrightarrow

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\Leftrightarrow

05

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12

$$\text{⑩} \rightarrow C_3 \leftrightarrow C_2$$

$$\begin{bmatrix} 14 & 4 & 3 & : & 7 \\ 0 & 0 & -1 & : & -4 \\ 0 & -5 & -11 & : & -35 \end{bmatrix}$$

$$R_3 \leftarrow R_2$$

$$\begin{bmatrix} 14 & 3 & 9 & : & 7 \\ 0 & -11 & -5 & : & -35 \\ 0 & -1 & 0 & : & -4 \end{bmatrix}$$

$$\text{13} \rightarrow R_2 - 11R_3$$

$$\begin{bmatrix} 14 & 3 & 9 & : & 7 \\ 0 & -11 & -5 & : & -35 \\ 0 & 1 & 4 & : & 4 \end{bmatrix}$$

Luko gmo

$$R_3 \rightarrow R_2 - 11R_3$$

$$\text{14} \rightarrow R_2 - 11R_3$$

$$\begin{bmatrix} 14 & 3 & 9 & : & 7 \\ 0 & -11 & -5 & : & -35 \\ 0 & 1 & 4 & : & 4 \end{bmatrix}$$

$$\text{15} \rightarrow R_2 - 11R_3$$

$$\begin{bmatrix} 14 & 3 & 9 & : & 7 \\ 0 & -11 & -5 & : & -35 \\ 0 & 1 & 4 & : & 4 \end{bmatrix}$$

$$-11x_2 - 5x_3 = -35$$

$$-11x_2 + 11 = -35$$

$$+11x_2 = +46$$

$$\text{16} \rightarrow R_2 = \frac{46}{11}$$

$$R_2 = \frac{46}{11}$$

$$R_2 = \frac{46}{11}$$

$$R_2 = \frac{46}{11}$$

06

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* Thermal algorithm for Tri-diagonal systems

$$\begin{array}{cccc|c} a_{11} & a_{12} & 0 & \dots & 0 & b_1 \\ a_{21} & a_{22} & a_{23} & \dots & 0 & b_2 \\ 0 & 0 & 0 & \dots & 0 & b_3 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & 0 & \dots & 0 & b_n \end{array}$$

Step 1 (i) Divide R_1 by a_{11}

Step 2 (ii) Clear the pivot row R_1 to get zeroes
~~on C_1~~ convert $a_{12} = 0$ by

$$R_2 \rightarrow R_2 - a_{12}(R_1)$$

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tri-diagonal matrix

[A = D]

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$$\begin{matrix} 09 & \left[\begin{array}{cccc} a_1 & b_1 & c_1 & 0 \\ a_2 & b_2 & c_2 & 0 \\ 0 & b_3 & c_3 & 0 \\ 0 & 0 & b_4 & c_4 \end{array} \right] \xrightarrow{\text{1st diagonal}} & \left[\begin{array}{c} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array} \right] = \left[\begin{array}{c} d_1 \\ d_2 \\ d_3 \\ d_4 \end{array} \right] \\ 10 & & \\ 11 & & \\ 12 & & \end{matrix}$$

3rd 2nd diagonals
diagonal

1st step :- Make all $b = 1$.

2nd step :- Make all $a = 0$.

3rd step :- Also change d values

(by using row & column matrix)

$$\begin{matrix} 6 & \left[\begin{array}{cccc} b_1/b_1 & c_1/b_1 & 0 & 0 \\ a_2 & b_2 & c_2 & 0 \\ 0 & a_3 & b_3 & c_3 \\ 0 & 0 & a_4 & b_4 \end{array} \right] \xrightarrow{\text{2nd}} & \left[\begin{array}{c} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array} \right] = \left[\begin{array}{c} d_1/b_1 \\ d_2 \\ d_3 \\ d_4 \end{array} \right] \\ 7 & & \\ 8 & & \end{matrix}$$

4th step :- Make all $c = 0$

5th step :- Now using row & column operations

$$\begin{matrix} 12 & \Delta & \left[\begin{array}{cccc} 1 & c_1/b_1 & 0 & 0 \\ 0 & b_2 - a_2 c_1 & c_2 & 0 \\ 0 & a_3 & b_3 & c_3 \\ 0 & 0 & b_4 & c_4 \end{array} \right] \xrightarrow{\text{3rd}} & \left[\begin{array}{c} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array} \right] = \left[\begin{array}{c} d_1/b_1 \\ d_2 - a_2 d_1/b_1 \\ d_3 \\ d_4 \end{array} \right] \\ 1 & & \\ 2 & & \end{matrix}$$

$$\begin{matrix} 3 & \text{My task 1, for tasks 0 and so on.} \\ 4 & \text{until step 1 & step 2 are satisfied} \end{matrix}$$

6th generalising,

$$\begin{matrix} 5 & \left[\begin{array}{c} c_n' = \frac{c_n}{b_n - a_n c_{n-1}'} \\ d_n' = \frac{d_n - a_n d_{n-1}'}{b_n - a_n c_{n-1}'} \end{array} \right] \xrightarrow{\text{6th}} & \left[\begin{array}{c} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array} \right] = \left[\begin{array}{c} d_1/b_1 \\ d_2 - a_2 d_1/b_1 \\ d_3 - a_3 d_2/b_2 \\ d_4 - a_4 d_3/b_3 \end{array} \right] \\ 6 & & \\ 7 & & \end{matrix}$$

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10

$$10. \begin{bmatrix} 1 & c_1' & 0 \\ 0 & 1 & c_2' \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} d_1' \\ d_2' \\ d_3' \end{bmatrix}$$

$$11. \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & b_4' \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} d_1' \\ d_2' \\ d_3' \\ d_4' \end{bmatrix}$$

~~$$12. \text{ by division } \rightarrow \begin{bmatrix} b_4' x_4 = d_4' \end{bmatrix}$$~~

The eqn.

Final,

LU Decomposition same as 3rd sch

Final,

$$AX = B$$

$$\text{where } A = LU$$

$$10. \begin{bmatrix} 1 & 0 & 1,3 \\ 0 & 1 & 2,1 \\ 0 & 0 & 1,2 \end{bmatrix}, \begin{bmatrix} U_{11} & U_{12} & U_{13} \\ U_{21} & U_{22} & U_{23} \\ 0 & 0 & U_{33} \end{bmatrix}$$

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10	4	5	6	7	8	9
11	11	12	13	14	15	16
12	18	19	20	21	22	23
13	25	26	27	28	29	30
14	26	27	28	29	30	31

WEEK	M	T	W	T	F	S
9	1	2	3	4	5	6
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11	16	17	18	19	20	21
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$$L = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, U = \begin{bmatrix} U_{11} & U_{12} & U_{13} \\ 0 & U_{22} & U_{23} \\ 0 & 0 & U_{33} \end{bmatrix}$$

$$10. LUX = B$$

$$11. \text{ but } LU = Y \quad X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \rightarrow \text{has no found but}$$

$$12. \boxed{LU = B} \quad Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix}$$

wrong then
X will be calculated,
calculated.

$$13. L_{11} = \frac{a_{11}}{a_{11}}, L_{31} = \frac{a_{31}}{a_{11}}, \dots L_{11} = \frac{a_{11}}{a_{11}}$$

4. Using Gauss' elimination in
5. LU decomposition method,

6. A pr now the set of operations like used
L, U in decomposition know now.



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* Cholesky method - method to solve linear eqns.

09 Working rule -

10 $AX = B$

11 Let $A = LL^T$, where
 $L = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{pmatrix}$
 $- \textcircled{1}$
 $- \textcircled{2}$.

12 $L = \begin{pmatrix} l_{11} & 0 & 0 \\ 0 & l_{22} & 0 \\ 0 & 0 & l_{33} \end{pmatrix}$

13 $U = \begin{pmatrix} l_{11} & l_{21} & l_{31} \\ 0 & l_{22} & l_{32} \\ 0 & 0 & l_{33} \end{pmatrix}$

Then, find values of $l_{11}, l_{21}, l_{31}, l_{32}, l_{22}, l_{33}$

5 By $\textcircled{1}$ & $\textcircled{2}$,

6 $U^T X = B$

7 Let $\boxed{U^T X = Y}$ where, $Y = \begin{pmatrix} y_1 \\ y_2 \\ y_3 \end{pmatrix}$

8 Solve the system of eqn by cholesky method.

$$x + 2y + 3z = 5$$

$$2x + 8y + 2z = 6$$

$$3x + 2y + 8z = -10$$

$$\rightarrow A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 8 & 2 \\ 0 & 0 & 8 \end{pmatrix}, B = \begin{pmatrix} 5 \\ 6 \\ -10 \end{pmatrix}$$

9 $A = LL^T$

$$\rightarrow \begin{pmatrix} 1 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 8 \end{pmatrix} = \begin{pmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{pmatrix} \begin{pmatrix} l_{11} & l_{21} & l_{31} \\ 0 & l_{22} & 0 \\ 0 & 0 & l_{33} \end{pmatrix}$$

10 On solving, we get, $\boxed{l_{31} = 3}$, $\boxed{l_{21} = 2}$, $\boxed{l_{11} = 1}$, $\boxed{l_{22} = 2}$

$$\boxed{l_{32} = 8}, \boxed{l_{33} = 3}, \boxed{l_{22} = 2}, \boxed{l_{11} = 1}, \boxed{l_{21} = 2}$$

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1 2 3 4

5 6 7 8 9 10 11

12 13 14 15 16 17 18

19 20 21 22 23 24 25

26 27 28 29 30 31

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WK M T W T F S

9 10 11 12 13 14 15

16 17 18 19 20 21 22

23 24 25 26 27 28 29

30 31



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$$9 \quad L = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 0 & 0 \\ 3 & 8 & 3 \end{bmatrix} \quad U = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 8 \\ 0 & 0 & 3 \end{bmatrix}$$

$$10 \quad \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 8 \\ 0 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 5 \\ -2 \\ -3 \end{bmatrix}$$

$$11 \quad L^{-1}x = B$$

$$12 \quad L^{-1}y = \beta$$

$$13 \quad \begin{bmatrix} 1 & 0 & 0 \\ 2 & 0 & 0 \\ 3 & 8 & 3 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 5 \\ 8 \\ -10 \end{bmatrix}$$

$$14 \quad \boxed{y_1 = 5}$$

$$15 \quad 2y_1 + 8y_2 = 6 \quad \boxed{y_1 + 4y_2 = 3}$$

$$16 \quad \begin{bmatrix} 5 \\ 5+y_2 = 3 \\ y_2 = -2 \end{bmatrix}$$

$$17 \quad 2y_1 + 8y_2 = 6 \quad y_1 + 4y_2 = 3$$

$$18 \quad 15 - 16 + 3y_3 = -10$$

$$19 \quad \boxed{3y_3 = -9}$$

$$20 \quad \boxed{y_3 = -3}$$

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$$21 \quad \text{where, } \boxed{U^{-1} = \frac{1}{|U|} \text{adj } U}, \boxed{L^{-1} = \frac{1}{|L|} \text{adj } L}$$

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$$\textcircled{A} A^{-1} = I$$

$$L L^T A^{-1} = I$$

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* Matrix inverse using Cholesky method -

09

$$A = L L^T \rightarrow \text{Cholesky: } \textcircled{1} \quad L = \begin{bmatrix} l_{11} & 0 & 0 \\ l_{21} & l_{22} & 0 \\ l_{31} & l_{32} & l_{33} \end{bmatrix}$$

10

11 find values of L & L^T .

12

then we know for any matrix B

$$B^T B^{-1} = I$$

13

$\textcircled{3} \quad L L^{-1} = I \rightarrow$ yaha se L^{-1} nikalo

14

$$\textcircled{4} \quad \text{let } C^T = \begin{bmatrix} L_{11} & 0 & 0 \\ L_{21} & L_{22} & 0 \\ L_{31} & L_{32} & L_{33} \end{bmatrix}$$

Now Now

$$A^{-1} = L^{-1} (L^T)^{-1} \text{ from } \textcircled{1}$$

15

$$\textcircled{5} \quad A^{-1} = L^{-1} (L^{-1})^T \rightarrow \text{yaha se } A^{-1} \text{ niklega}$$

16

$$\textcircled{6} \quad L^{-1} \text{ se aayega}$$

17

$$\textcircled{7} \quad x^{(0)} = 0, x_2^{(0)} = 0, x_3^{(0)} = 0.$$

will put values (initial) till next iteration
values are not calculated.

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* Gauss Seidel method -

18 solve the system of eqn by using Gauss-Seidel iterative method.

$$\begin{aligned} \textcircled{1} \quad 2x_1 - x_2 + 0x_3 &= 7 & -\textcircled{1} \\ -x_1 + 2x_2 - x_3 &= 1 & -\textcircled{2} \\ 0x_1 - x_2 + 2x_3 &= 1 & -\textcircled{3} \end{aligned}$$

$$\begin{aligned} \textcircled{1} \quad 2x_1 - x_2 + 0x_3 &= 7 & -\textcircled{1} \\ -x_1 + 2x_2 - x_3 &= 1 & -\textcircled{2} \\ 0x_1 - x_2 + 2x_3 &= 1 & -\textcircled{3} \end{aligned}$$

Using $\textcircled{1}, \textcircled{2}$ & $\textcircled{3}$ to find values of x_1, x_2 & x_3 resp.

$$\textcircled{2} \quad x_1 = \frac{7+x_2}{2}$$

$$\textcircled{3} \quad x_2 = \frac{1+x_3+x_1}{2}$$

$$\textcircled{4} \quad x_3 = \frac{1+x_2}{2}$$

Now, initial approximation:

8

$x_1^{(0)} = 0, x_2^{(0)} = 0, x_3^{(0)} = 0.$
will put values (initial) till next iteration
values are not calculated.

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$$\frac{1}{2} \alpha_1^{(0)} = \frac{7 + \alpha_2^0}{2} = \frac{7}{2} = 3.5$$

$$\frac{1}{2} \alpha_2^{(1)} = \frac{1 + \alpha_3^0 + \alpha_1^1}{2} = \frac{1 + 0 + 3.5}{2} = \frac{4.5}{2} = 2.25$$

$$\alpha_3^{(1)} = \frac{1 + 2.25}{2} = 1.625$$

$$\alpha_3^{(1)} = \frac{1 + 2.25}{2} = 1.625$$

2nd iteratn -

$$\alpha_1^{(2)} = \frac{1}{2} (7 + \alpha_2^1) = \frac{7 + 2.25}{2} = \frac{9.25}{2} = 4.625$$

$$\alpha_2^{(2)} = \frac{1 + \alpha_3^1 + \alpha_1^2}{2} = \frac{1 + 1.625 + 4.625}{2} = \frac{7.25}{2} = 3.625$$

$$\alpha_3^{(2)} = \frac{1 + 2.25}{2} = 1.625$$

3rd iteratn -

$$\alpha_1^{(3)} = \frac{1}{2} \alpha_2^2 = \frac{1}{2} \alpha_2^3 = 5.65625$$

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4th iteratn -

$$\alpha_1^{(4)} = \frac{1 + \alpha_2^3}{2} = \frac{1 + 4.625}{2} = 2.65625$$

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On 4th iteration -
 $x_1^{(7)} = 5.9570, x_2^{(7)} = 4.09540,$
 $x_3^{(7)} = 2.9785$

11
 $x_1 \approx 6$
 $x_2 \approx 5$
 $x_3 \approx 3.$

$$\begin{cases} x_1 = 6 \\ x_2 = 5 \\ x_3 = 3. \end{cases}$$

* Power method for eigenvectors and eigenvalues

Q. Determine the largest eigen value and corresponding eigenvector of the matrix.

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

→

11 Power method is particularly used for estimating numerically largest or smallest eigen value and its corresponding eigenvector.

12 The power method which is iterative method can be used when

- The matrix A of order n has n linearly independent eigen vectors.
- 1. The eigen values can be ordered in magnitude as
- 2. $| \lambda_1 | \geq | \lambda_2 | \geq | \lambda_3 | \geq | \lambda_4 | \geq \dots \geq | \lambda_n |$

Q. Find the numerically largest eigen value of the matrix by the power method.

$$A = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$$

Take initial approx as : $x_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$

$$\rightarrow$$

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\rightarrow initially, $X_0 = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ (given)
Iteration 1st

$$AX_0 = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1-3+2 \\ 4+4-1 \\ 6+3+5 \end{bmatrix} = \begin{bmatrix} 0 \\ 7 \\ 14 \end{bmatrix}$$

2. take the largest value to update X_0 or else EV consider
 prong for let's through.
 3. 14 is the largest.

$$\Rightarrow 14 \begin{bmatrix} 0 \\ 0.5 \\ 1 \end{bmatrix}$$

Iteration 2nd: Now, $X_0 = \begin{bmatrix} 0 \\ 0.5 \\ 1 \end{bmatrix}$

$$AX_0 = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix} \begin{bmatrix} 0 \\ 0.5 \\ 1 \end{bmatrix} = \begin{bmatrix} 0.076 \\ 0.676 \\ 0.153 \end{bmatrix}$$

At the end of 2nd iteration, largest eigenvalue = 6.5

Iteration 3rd: $X_0 = \begin{bmatrix} 0.076 \\ 0.676 \\ 0.153 \end{bmatrix}$

$$AX_0 = \begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix} \begin{bmatrix} 0.076 \\ 0.676 \\ 0.153 \end{bmatrix} = \begin{bmatrix} 1.6454 \\ -0.67691 \\ 5.92364 \end{bmatrix}$$

7. highest = 5.92364

$$\Rightarrow 5.92364 \begin{bmatrix} 0 \\ 0.15384 \\ 1 \end{bmatrix}$$

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- At the end of the iteration, eigenvalue changes

$$= 5.92304$$

10

- If no. of iterathns are given in the problem, go upto that iterathn.
If not given, go upto no. of iterathns till the value of the largest eigenvalue repeats.

* 2 INTERPOLATION -

The technique or method of estimating unknown values from given set of observations is known as interpolation.

for equal intervals

for unequal intervals

Method used

- \rightarrow Newton forward formula \rightarrow Lagrange interpolation
 \rightarrow Newton backward formula \rightarrow Newton divided difference
 \rightarrow Gauss forward/backward difference
 \rightarrow Shifting

 \rightarrow Bessel

Central difference

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WEEK	M	T	W	T	F	S
1	26	27	28	29	2	3
2	3	4	5	6	7	8
3	9	10	11	12	13	14
4	15	16	17	18	19	20
5	21	22	23	24	25	26
6	27	28	29	30	31	

24

FEBRUARY
2024
WK 09 DAY 055/311 WK 08

Interpolation for equal interval -

1. Estimate the population in 1895 & 1925 from following stats -

Year	1891	1901	1911	1921	1931
Population (in 1000)	46	66	81	93	101
	1891	1901	1911	1921	1931

$$\Rightarrow x \begin{bmatrix} f(x) \\ f(x+1000) \end{bmatrix} \Delta f(x) \begin{bmatrix} \Delta^2 f(x) \\ \Delta^3 f(x) \end{bmatrix} \Delta^4 f(x)$$

1	1891	46	20	-5	2	-
2	1901	66	15	-2	-3	-
3	1911	81	12	-1	-2	-
4	1921	93	8	-1	-1	-
5	1931	101				

$$\Delta f(x) = f(x+h) - f(x) \rightarrow \text{adj. w.r.t. term} - \text{phi w.r.t. term}$$

due operator. Δ is w.r.t. term (choose values to match with the given values)

MARCH 2024

WEEK	M	T	W	T	F	S
1	9	10	11	12	13	14
2	10	11	12	13	14	15
3	11	12	13	14	15	16
4	12	13	14	15	16	17
5	13	14	15	16	17	18
6	14	15	16	17	18	19
7	15	16	17	18	19	20
8	16	17	18	19	20	21
9	17	18	19	20	21	22
10	18	19	20	21	22	23
11	19	20	21	22	23	24
12	20	21	22	23	24	25
13	21	22	23	24	25	26
14	22	23	24	25	26	27
15	23	24	25	26	27	28
16	24	25	26	27	28	29
17	25	26	27	28	29	30
18	26	27	28	29	30	31



25

SUNDAY
FEBRUARY 2024
WK 08 DAY 056-310Newton forward formula -

$$\text{f}(a+u) = \text{f}(a) + \frac{u}{1!} \Delta \text{f}(a) + \frac{u(u-1)}{2!} \Delta^2 \text{f}(a)$$

$$+ \frac{u(u-1)(u-2)}{3!} \Delta^3 \text{f}(a) +$$

$$+ \frac{u(u-1)(u-2)(u-3)}{4!} \Delta^4 \text{f}(a) + \dots$$

$$+ \frac{u(u-1)(u-2)(u-3)(u-4)}{5!} \Delta^5 \text{f}(a) + \dots$$

$$+ \frac{u(u-1)(u-2)(u-3)(u-4)(u-5)}{6!} \Delta^6 \text{f}(a) + \dots$$

² Note If is used when we have to find po dekhaa upr bi kope value nakaalni ho.

$$\text{f}(1895) = ?$$

$$\text{f}(a) = 1891$$

$$u = 4 \quad (n = 10)$$

$$u = \frac{4}{10} = 0.4$$

$\Rightarrow \boxed{u = 0.4}$.

habla operator

FEBRUARY 2024						
WEEK	M	T	W	T	F	S
1		1	2	3	4	
2	5	6	7	8	9	10
3	11	12	13	14	15	16
4	17	18	19	20	21	22
5	23	24	25	26	27	28
6	29	30	31			

MARCH 2024						
WEEK	M	T	W	T	F	S
1	9		1	2	3	
2	10	11	12	13	14	
3	15	16	17	18	19	
4	20	21	22	23	24	
5	25	26	27	28	29	30
6	31					

2024
FEBRUARY
MONDAY
FEBRUARY 2024
DAY 057-309 WK 09

26

MONDAY
MARCH 2024

$$\begin{aligned} 1 & \text{f}(1895) = \text{f}(1891) + \frac{0.4}{1!} \Delta \text{f}(1891) + \\ 2 & \quad \quad \quad \frac{0.4(0.4-1)}{2!} \Delta^2 \text{f}(1891) + \\ 3 & \quad \quad \quad \frac{0.4(0.4-1)(0.4-2)}{3!} \Delta^3 \text{f}(1891) + \\ 4 & \quad \quad \quad \frac{0.4(0.4-1)(0.4-2)(0.4-3)}{4!} \Delta^4 \text{f}(1891) + \\ 5 & \quad \quad \quad \frac{0.4(0.4-1)(0.4-2)(0.4-3)(0.4-4)}{5!} \Delta^5 \text{f}(1891) + \\ 6 & \quad \quad \quad \frac{0.4(0.4-1)(0.4-2)(0.4-3)(0.4-4)(0.4-5)}{6!} \Delta^6 \text{f}(1891) + \dots \end{aligned}$$

$$\begin{aligned} 1 & = 1891 + 0.4(20000) + 0.12(5000) \\ 2 & = 1891 + 8000 + 600 - 298 + 1240 \\ 3 & = 1891 + 8000 + 600 - 298 + 1240 \\ 4 & = 1891 + 8000 + 600 - 298 + 1240 \\ 5 & = 1891 + 8000 + 600 - 298 + 1240 \\ 6 & = 1891 + 8000 + 600 - 298 + 1240 \\ 7 & = 1891 + 8000 + 600 - 298 + 1240 \end{aligned}$$

$$\boxed{\nabla f(x) = f(x) - f(x-h)}$$



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TUESDAY
WEEK 09 DAY 058 308

Newton backward formula -

$$f(a+h) = f(a) + \frac{u}{1!} \nabla f(a) + \frac{u(u+1)}{2!} \nabla^2 f(a) +$$

$$u(u+1)u(u+2) \nabla^3 f(a) +$$

$$3!$$

$$u(u+1)(u+2)(u+3) \nabla^4 f(a) + \dots$$

$$4!$$

$$2$$

If u is in opp. card of NF.

$$4 \text{ June}, f(1925) \Rightarrow a+6u = 1925$$

$$5 \text{ July}, a = 1931 \Rightarrow 1931 + 10u = 1925$$

on solving & putting value in formula

$$f(1925) = 96836$$

$\nabla f(a)$ kis jign

After we do it

\square NF me a up waali value
NB me a neech waali value.

FEBRUARY 2024						
WK	M	T	W	T	F	S
5		1	2	3	4	9
6	5	6	7	8	9	10
7	12	13	14	15	16	17
8	19	20	21	22	23	24
9	26	27	28	29	30	31

2024

FEBRUARY

WEDNESDAY
DAY 059-307 WK 09

28

x	f(x)	$\nabla f(x)$	$\Delta^2 f(x)$	$\Delta^3 f(x)$
below 10	9	30	5	2
below 20	39	35	7	
below 30	74	49	7	
below 40	116			

NF will be used.

$$a = 10, h = 10$$

$$5 \Rightarrow 15 = 10 + 10u \Rightarrow u = 0.5$$

$$6 f(15) = 9 + 0.5(30) + \frac{(0.5)(-0.5)}{2}(5)$$

$$7 + \frac{(0.5)(-0.5)}{6}(-1.5)(2)$$

$$= 9 + 15 - 0.625 + 0.125 \\ = 23.5 \approx 24$$



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THURSDAY
WEEK 09 DAY 060-306FEBRUARY
2024

2024

IMPORTANT
NOTES

Q. No. of men getting wages b/w Rs 10 & Rs 15
 $\therefore x^4 - 9 = 15$

Q. Find the lowest degree polynomial $y(x)$ that fit the data, find $y(5)$.

x	0	2	4	6	8
y	5	9	61	209	501

$f(x)$	$\Delta f(x)$	$\Delta^2 f(x)$	$\Delta^3 f(x)$	$\Delta^4 f(x)$
5	4	48	48.	
9	52	96	48	0
61	148	148		
209	292			
501				

NF - $f(x) = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4$ Using NF -

$f(x) = ? \quad x = a + h$

$a=0, h=2$

$\therefore f(x) = \underline{a_0 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4}$

FEBRUARY 2024						
WK	M	T	W	T	F	S
1					1	2
2		3	4		5	6
3	5	6	7	8	9	10
4	10	11	12	13	14	15
5	16	17	18	19	20	21
6	22	23	24	25	26	27
7	28	29	30	31		

MARCH 2024						
WK	M	T	W	T	F	S
1					9	10
2		1	2	3	4	5
3	6	7	8	9	10	11
4	11	12	13	14	15	16
5	17	18	19	20	21	22
6	23	24	25	26	27	28
7	29	30	31			



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