1) Lagrange ✓

2) Newton → $P_3(x) = a_0 + a_1(x-x_0) + a_2(x-x_0)\cdot(x-x_1) + a_3(x-x_1)(x-x_0)(x-x_2)$

3) Newton ileri $P_3(x) = f(x_0) + sh\,f(x_0x_1) + s(s-1)\cdot h^2 f(x_0x_1x_2) + s\cdot(s-1)\cdot(s-2)\cdot h^3\cdot f(x_0x_1x_2x_3)$ $\left(s = \frac{x-x_0}{h}\right)$

4) Newton Geri $P_3(x) = f(x_3) + sh f(x_3x_2) + s\cdot(s+1)\cdot h^2 f(x_3x_2x_1) + s\cdot(s+1)\cdot(s+2)\cdot h^3 f(x_3x_2x_1x_0)$ $\left(s = \frac{x-x_n}{h}\right)$ yani negatif

5) Newton Orta $P_2(x) = f(x_0) + sh\cdot\left(\frac{f(x_{-1}x_0) + f(x_0x_1)}{2}\right) + s^2h^2 f(x_{-1}x_0x_1)$ $\left(s = \frac{x-x_0}{h}\right)$ $(h = x_1 - x_0)$

6) Hermit

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7) n=1 Trapez

8) n=2 Simpson

9) n=3 Simpson 3/8

10) n=4 Boole

→

mesela aralık 1 ve 1,6 arasında;

$\frac{1}{2}\cdot h\cdot$ (1 1) — x_0, x_1 — 1 1,6

$\frac{1}{3}\cdot h\cdot$ (1 4 1) 1 1,3 1,6

$\frac{3}{8}\cdot h\cdot$ (1 3 3 1) 1 1,2 1,4 1,6

$\frac{2}{45}\cdot h\cdot$ (7 32 12 32 7) 1 1,15 1,30 1,45 1,60

Yani; $\frac{2}{45}\cdot h\cdot\left(7\cdot f(1) + 32\cdot f(1{,}15) + 12\cdot f(1{,}30) + 32\cdot f(1{,}45) + 7\cdot f(1{,}6)\right)$ olur.

h değerleri: n=1 Trapez $\frac{b-a}{1}$

n=2 Simpson 1/3 $\frac{b-a}{2}$

n=3 Simpson 3/8 $\frac{b-a}{3}$

n=4 Boole $\frac{b-a}{4}$

b ne? a ne? $\int_{1}^{1{,}6} x^2 - 2x + 3$ → b, a

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11) Euler

12) Heun

13) Taylor

14) Runge Kutta

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15) LU Ayrıştırması (Soru Gelebilir ★)

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16) Newton

17) Sabit Nokta (1)

18) Sabit Nokta (2)

Euler: $y(t_1) = y(t_0) + hf(t_0, y(t_0))$

ÖR) $y' = \frac{t-y}{2}$ $[0,3]$ $y(0)=1$ $h=1/4$

$y_1 = 1 + \frac{1}{4}\cdot\left(\frac{0-1}{2}\right) = 0{,}875$

$y_2 = 0{,}875 + \frac{1}{4}\cdot\left(\frac{0{,}25-0{,}875}{2}\right) = 0{,}79\ldots$

Heun: $p_{k+1} = y_k + hf(t_k, y_k)$

$y_{k+1} = y_k + \frac{h}{2}\cdot\left(f(t_k, y_k) + f(t_{k+1}, p_{k+1})\right)$

ÖR) $y' = \frac{t-y}{2}$ $[0,3]$ $y(0) = 1$ $h = 1/4$

$p_1 = 1 + \frac{1}{4}\cdot\left(\frac{0-1}{2}\right) = 0{,}875$

$y_1 = 1 + \frac{1}{8}\cdot\left(\left(\frac{0-1}{2}\right) + \left(\frac{0{,}25-0{,}875}{2}\right)\right) = 0{,}89\ldots$

$p_2 = \ldots$

$y_2 = \ldots$

$p_3 = \ldots$

$y_3 = \ldots$

Runge kutta: $y_{k+1} = y_k + \frac{h(f_1 + 2f_2 + 2f_3 + f_4)}{6}$

$f_1 = f(t_k, y_k)$

$f_2 = f\left(t_k + \frac{h}{2}, y_k + \frac{h}{2}f_1\right)$

$f_3 = f\left(t_k + \frac{h}{2}, y_k + \frac{h}{2}f_2\right)$

$f_4 = f(t_k + h, y_k + h\cdot f_3)$

Taylor: $y_{k+1} = y_k + d_1\cdot h + \frac{d_2h^2}{2!} + \frac{d_3h^3}{3!} + \frac{d_4h^4}{4!}$

ÖR) $y' = \frac{t-y}{2}$ $[0,3]$ $y(0) = 1$ $h = 1/4$

$\boxed{y'(t) = \frac{t-y}{2}}$ $d_1 = y'(0) = \frac{0-1}{2} = -0{,}5$

$\boxed{y''(t) = \frac{1-y'}{2} = \frac{1 - \left(\frac{t-y}{2}\right)}{2} = \frac{2-t+y}{4}}$ $d_2 = y''(0) = 0{,}75$

$\boxed{y'''(t) = \frac{0-1+y'}{4} = \frac{0-1+\frac{t-y}{2}}{4} = \frac{-2+t-y}{8}}$ $d_3 = y'''(0) = -0{,}375$

$\boxed{y^{4}(t) = \frac{-2-t+y}{16}}$ $d_4 = 0{,}1875$

$\Rightarrow y_1 = 1 + \frac{1}{4}\cdot(-0{,}5) + \left(\frac{1}{4}\right)^2\cdot\frac{0{,}75}{2!} + \left(\frac{1}{4}\right)^3\cdot\frac{-0{,}375}{3!} + \left(\frac{1}{4}\right)^4\cdot\frac{0{,}1875}{4!} = 0{,}89\ldots$

ÖR) $y' = \frac{t-y}{2}$, $[0,3]$, $y(0)=1$, $h=1/4$ (Runge-kutta)

Çöz: $y_{k+1} = y_k + \frac{h.(f_1+2f_2+2f_3+f_4)}{6}$

$f_1 = f(t_k, y_k) = \frac{0-1}{2} = -0,5$

$f_2 = f(t_k+\frac{h}{2}, y_k+\frac{h}{2}.f_1)$ $\frac{0,125 - 1 + 0,125 \cdot -0,5 \quad 0,0625}{2} = -0,46875$

$f_3 = f(t_k+\frac{h}{2}, y_k+\frac{h}{2}.f_2)$ $\frac{0,125 - 1 + 0,125 \cdot -0,46875}{2} = -0,466796875$

$f_4 = f(t_k+h, y_k+h.f_3) \rightarrow \frac{0,25 - 1 + \cancel{\frac{1}{4}}\,0,25 \cdot -0,4667\ldots}{2} = -0,4333\ldots$

$y_1 = 1 + \frac{1}{4}\Big($ $= 0,88315$

1.'i

LU : $(A = L.U)$

$$\boxed{\begin{array}{c} A.x = b \\ L.\underbrace{U.x}_{y} = b \\ Ly = b \\ Ux = y \end{array}}$$

$\boxed{R(x) = x - J^{-1}.f(x)}$

Newton's: $\boxed{\text{Scale} = \text{initialvalue} - J^{-1}.f(x)}$

kolon

2x2 2x1