$$x\left(4x^2+27x-18\right)$$

36 +

$$x^4+9x^3-9x^2-3\cancel{5}9$$

$$4x^3+27x^2-18x$$

$$x^2\left(x^2-9x+\cancel{3}\right)$$

0, 0

$$\cancel{3}\,4x^3-27x^2+18x$$

$$x($$

$$(x-3)^4 = x^4-12x^3+54x^2-108x+81$$

$$x_n = \lambda_1^n c_1 v_1 + \lambda_2^n c_2 v_2 + \dots + \lambda_N^n c_N v_N$$

$$|\lambda_i| > |\lambda_k|$$

$$\underline{\underline{x_n}} < \left(\underline{\underline{\lambda_i^n}}\right)\left[\left(\frac{\lambda_1}{\lambda_i}\right)^n c_1 v_1 + \left(\frac{\lambda_2}{\lambda_i}\right)^n c_2 v_2 + \dots + (c_i \cdot v_i) + \dots + \left(\frac{\lambda_N}{\lambda_i}\right)^n c_N v_N\right]$$

$\to 0$ $\quad\to\quad\to$

$$x_n \to \lambda_i^n c_i v_i$$

$$\frac{x_{n+1}}{x_n} = \frac{\lambda_i^{n+1}\left[\;\to 0,\; c_i v_{ij}\right]}{\lambda_i^n\left[\;\to 0,\; c_i v_{ij}\right]} = \frac{\lambda_i^{n+1} \cancel{c_i v_{ij}}}{\cancel{\lambda_i^n} \cancel{c_i v_{ij}}}$$

$$x_n = c_1 v_1 \lambda_1^n + c_2 v_2 \lambda_2^n + \dots + c_i \lambda_i^n v_i + \dots + c_N \lambda_N^n v_N$$

$$\frac{x_n}{\lambda_i^n} = c_i v_i$$

$$\underset{\sim}{v} = \frac{c_i v_i}{|c_i v_i|}$$

$$\begin{array}{c|c} & \begin{array}{ccc} k & k & k \end{array} \\ i & \begin{bmatrix} 0 & 0 & 0 \\ & & \\ & & \end{bmatrix} \end{array} \cdot \begin{bmatrix} 0_k \\ 0_k \\ 0_k \end{bmatrix}$$

$$y' = Ay$$

$$\left(1 + \frac{a}{h}\right)^h \to e^a$$

$$y_{n+1} = y_n + h\lambda y_n = (1 + h\lambda) y_n$$

$n=0$: $y_1 = (1+h\lambda) y_0$

$n=1$: $y_2 = (1+h\lambda) y_1 = (1+h\lambda)(1+h\lambda) y_0 = (1+h\lambda)^2 y_0$

$\vdots$

$$\boxed{y_n = (1+h\lambda)^n}$$

$$|1 + h\lambda| < 1 \iff |1 - 10h| < 1 \iff$$

$$-1 < 1 - 10h < 1$$

$$-2 < -10h < 0$$

$$\boxed{\frac{1}{5} > h > 0}$$

$$1 + 0.2 \cdot (-10) = 1 - 2 = -1$$

$$y_{n+1} = y_n + h f\left(t_n + \frac{h}{2}, \frac{y_n}{2} + \frac{y_{n+1}}{2}\right)$$

$$\varepsilon^{l}_{n+1} = y(t_{n+1}) - \left[y(t_n) + h f\left(t_n + \frac{h}{2}, \frac{y(t_n) + y(t_{n+1})}{2}\right)\right]$$

$$= \cancel{y(t_n)} + \cancel{h y'(t_n)} + \frac{h^2}{2!} y''(t_n) + \frac{h^3}{3!} y'''(t_n) + \cdots$$

$$- \left[\cancel{y(t_n)} + h\left(\underbrace{\cancel{f(t_n, y(t_n))}}_{y'(t_n)} + \frac{\partial f}{\partial t}\Big|_n \cdot \frac{h}{2} + \frac{\partial f}{\partial y}\Big|_n \cdot \left(\frac{y(t_n)}{2} + \frac{y(t_{n+1})}{2} - y(t_n)\right)\right.\right.$$

$$+ \frac{1}{2!}\frac{\partial^2 f}{\partial t^2}\Big|_n \cdot \left(\frac{h}{2}\right)^2 + \frac{\partial^2 f}{\partial y^2}\Big|_n \cdot \frac{1}{2!}\left(\frac{y(t_n) + y(t_{n+1})}{2} - y(t_n)\right)^2 + \left.\left.\frac{\partial^2 f}{\partial t \partial y}\frac{h}{2}\left(\cdots\right)\right)\right]$$

$$= \frac{h^2}{2!}\left[\frac{\partial f}{\partial t}\Big|_n + \frac{\partial f}{\partial y}\Big|_n \cdot y'(t_n)\right] + \cdots - \frac{h^2}{2}\frac{\partial f}{\partial t}\Big|_n - h\frac{\partial f}{\partial y}\Big|_n \left(\frac{y(t_{n+1})}{2} - \frac{y(t_n)}{2}\right)$$

$$- \ldots$$

$$= \frac{h^2}{2!}\left[\cancel{\frac{\partial f}{\partial t}\Big|_n} + \frac{\partial f}{\partial y}\Big|_n \cdot y'(t)\right] - \cancel{\frac{h^2}{2}\frac{\partial f}{\partial t}}\Big|_n - h\frac{\partial f}{\partial y}\Big|_n \cdot \left[\cancel{\frac{y(t_n)}{2}} + \right.$$

$$\left. + \frac{h y'(t_n)}{2} + \frac{\cdots}{2} - \cancel{\frac{y(t_n)}{2}}\right]$$

$$y'' = \frac{d}{dt}(y') = \frac{d}{dt} f = \frac{\partial f}{\partial t} + \frac{\partial f}{\partial y}\cdot\frac{dy}{dt} = \frac{\partial f}{\partial t} + \frac{\partial f}{\partial y}\cdot y'$$

$$y' = t^{-2} - t^{-1} y - y^{2}$$

$$(-t^{-1})' = t^{-2} - t^{-1}(-t^{-1}) - (-t^{-1})^{2}$$

$$t^{-2} = t^{-2} + \cancel{t^{-2}} - \cancel{t^{-2}}$$