$x(k) = Cz_1^k + Dz_2^k$ dla rekur.

$x(t) = Pe^{Jt}P^{-1}x(0)$
$x(t) = e^{tA}x_0 + \int_0^t e^{(t-r)A}Bu(r)dr$
$x(k) = A^k x(0) + \sum_{j=0}^{k-1} A^{k-1-j}Bu(j)$

$\lambda_1 \neq \lambda_2 \quad x = c_1 e^{\lambda_1 t} + c_2 e^{\lambda_2 t}$
$\lambda_1 = \lambda_2 \quad x = c_1 e^{\lambda t} + c_2 e^{\lambda t} t$
$\lambda_{1,2} = p \pm iq \quad x = c_1 e^{pt}\cos qt + c_2 e^{pt}\sin qt$

$A^+ = e^{hA} \quad B^+ = \int_0^h e^{tA}Bdt \quad x^+(i) = x(ih)$
$x^+(i+1) = A^+x^+(i) + B^+u^+(i)$
$e^{tJ} = e^{at}\begin{bmatrix} \cos bt & \sin bt \\ -\sin bt & \cos t \end{bmatrix}$ lub $\begin{bmatrix} e^{\lambda_1 t} & 0 \\ 0 & e^{\lambda_2 t} \end{bmatrix}$

$\lambda = \frac{z+1}{z-1} \to L(z) =$ licznik $\to$ wsp $> 0 \Rightarrow$ as. stab.
$|\lambda_i| < 1$ lub minor Hurw.$> 0 \Rightarrow$ as. stab.
$\Delta(\lambda) < 0$ oscylacje / zanikanie

$G(s) = C(sI - A)^{-1}B$
$Y(s) = G(s) \cdot U(s), U(s) = \frac{1}{s}$ dla sk. jed.
$\mathcal{L}\{a\} = a\frac{1}{s} \quad \mathcal{L}\{ae^{bt}\} = a\frac{1}{s-b}$
$\ddot{x} \to s^2Y(s)$ Michajłow - $M(j\omega)$

GH : $\det(j\omega I - J(x_r)) \neq 0$
L : $\dot{x}_{1,2} = 0 \to x_r, |J(x_r) - \lambda|, Re(\lambda) < 0$

$A^n = PJ^nP^{-1}$
$J^n = (\sqrt{a^2+b^2})^n \begin{bmatrix} \cos n\varphi & \sin n\varphi \\ -\sin n\varphi & \cos n\varphi \end{bmatrix}$

$\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ gwiazda, $\begin{bmatrix} -1 & 0 \\ 0 & 0 \end{bmatrix}$ poziome
$\begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix}$ węzeł zdeg., $\begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix}$ węzeł
$\begin{bmatrix} -1 & 1 \\ -1 & -1 \end{bmatrix}$ ognisko, $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ kółka

$y = u_r = RC\dot{u}_c \quad u - u_c - u_r = 0 \to \mathcal{L}$?
$i = c\dot{x} \quad u - Ri - x = 0$
$G(s) = X(s)/[\ddot{x} \to s^2X(s)] \quad |G(j\omega)| = max$
$m = M\frac{x}{l} \quad M\ddot{x} = mg \quad \dot{x}_2 = \ddot{x} = x_1\frac{g}{l}$
$G(j\omega) = a + bi \quad \varphi =$ arctg$\frac{b}{a}$
$A^n = 0 \Rightarrow x(n) = A^nx(0) = 0$
$\int -\frac{1}{2}te^{-t} = \frac{1}{2}te^{-t} + \frac{1}{2}e^{-t}$