??

$$\frac{d^2u}{dx^2} = 0 \tag{1}$$

$u(0) = 0$
$u(L) = 0$
$u(x) = 0$

$$\frac{u_{i+1} - 2u_i + u_{i-1}}{h^2} = 0 or, u_{i+1} - 2u_i + u_{i-1} = 0 of form, Ax = b \tag{2}$$

$x = A^{-1}b$
$x = Px + Q$
$P$
$Q$
??
$A = L + D + U$

$$(D+L+U)x = b (D+L)x = -Ux + b x^{j+1} = (D+L)^{-1}(-U)x^j + (D+L)^{-1}b \tag{3}$$

??
$P = (D + L)^{-1}(-U)$
$Q = (D + L)^{-1}$
??
$e^j = u^e - u^j$
$e^j$
$u^j$
$u$
th
$u^e = 0$
$e^j = -u^j$

$$u_i = sin\left(\frac{k\pi x_i}{L}\right) \tag{4}$$

$_m odes.eps Fourier modes$
??
??
??

$$e^n = P^n e^0 \tag{5}$$

$e^0$
$P$

$$e^0 = \Sigma C_k v_k \tag{6}$$

$C_k$
$e^0$
$v_k$
$P$
$P$
$e^0$
$\lambda$
??

$$e^n = \Sigma \lambda_k^n C_k v_k \tag{7}$$

??
$|\lambda_k|$
$P$
$P$
$P$

$$\lambda_k = 1 - sin^2\left(\frac{k\pi}{2N}\right) \qquad k = 1, 2, ...N \tag{8}$$

$_v s_k.eps Eigenvalues \lambda$
??
$\lambda$
??
??
$\lambda$
$\frac{k}{N}$
??