$$\frac{u_j^{n+1}-u_j^n}{\tau}-a^2\frac{u_{j+1}^{n+1}-2u_j^{n+1}+u_{j-1}^{n+1}}{h^2}=0$$

$$\frac{1}{\tau}[\lambda-1]-\frac{a^2}{h^2}[\lambda e^{i\alpha}-2\lambda+\lambda e^{-i\alpha}]=0$$

$$\lambda-1-\tau\frac{a^2}{h^2}[\lambda e^{i\alpha}-2\lambda+\lambda e^{-i\alpha}]=0$$

$$\lambda-1-r[\lambda e^{i\alpha}-2\lambda+\lambda e^{-i\alpha}]=0$$

$$\lambda-1-r\lambda e^{i\alpha}+2\lambda r-r\lambda e^{-i\alpha}=0$$

$$\lambda-r\lambda e^{i\alpha}+2r\lambda-re^{-i\alpha}\lambda=1$$

$$\lambda(1-re^{i\alpha}+2r-re^{-i\alpha})=1$$

$$\lambda = \frac{1}{1 - re^{i\alpha} + 2r - re^{-i\alpha}} = \frac{1}{1 + 2r - r(e^{i\alpha} + e^{-i\alpha})} =$$

$$= \frac{1}{1 + 2r - r(\cos\alpha + i\sin\alpha + \cos\alpha - i\sin\alpha)} = \frac{1}{1 + 2r - r(2\cos\alpha)} =$$

$$= \frac{1}{1 + 2r - 2r\cdot\cos\alpha} = \frac{1}{1 + 2r(1 - \cos\alpha)}$$

$1 - \cos\alpha \geq 0 \ \forall\alpha$

$$\left(\frac{1}{(1 + 2r(1 - \cos\alpha))}\right)^2 \leq 1$$

// $1 - \cos\alpha \in [0; 2]$

≤ 1, когда $1 + 2r(1 - \cos\alpha) \geq 1$

$2r(1 - \cos\alpha) \geq 0$

$r(1 - \cos\alpha) \geq 0$

$1 - \cos\alpha = 0$: $0 \geq 0$; $1 - \cos\alpha \neq 0$: $\boxed{r \geq 0}$

$$\frac{1}{(1 + 2r(1 - \cos\alpha))^2} \leq 1 \overset{r \geq 0}{\Leftrightarrow} \frac{1}{1 + 2r(1 - \cos\alpha)}$$

$r < 0$

$$\cancel{\Delta} \quad \frac{1}{1-2|r|(1-\cos\alpha)} \leq 1$$

$$1-2|r|(1-\cos\alpha) \geq 1$$

$$-2|r|(1-\cos\alpha) \geq 0$$

$$2|r|(1-\cos\alpha) \leq 0$$

$$|r|(1-\cos\alpha) \leq 0$$

$$|r| \leq 0$$

$$r = 0$$

возм. уб при

$r \geq 0$

0

$\alpha) \geq 0$

$\cancel{(1-\cos\alpha) \geq 0}$

ых и свободных