

Problem (Codes and Results)

명시적, 함축적, 크랭크-니콜슨 각각의 방법에 대해 열방정식의 수렴성(convergence) 테스트를 하시오.

참고)

	형태	정리 ($\alpha = \frac{k}{h^2}$)
명시적 방법	$\frac{u_i^{n+1} - u_i^n}{k} + O(k) = \frac{u_{i+1}^n - 2u_i^n + u_{i-1}^n}{h^2} + O(h^2)$	$u_i^{n+1} = u_i^n + \alpha(u_{i+1}^n - 2u_i^n + u_{i-1}^n)$
함축적 방법	$\frac{u_i^{n+1} - u_i^n}{k} = \frac{u_{i-1}^{n+1} - 2u_i^{n+1} + u_{i+1}^{n+1}}{h^2}$	$-\alpha u_{i-1}^{n+1} + (1 + 2\alpha)u_i^{n+1} - \alpha u_{i+1}^{n+1} = u_i^n$
크랭크-니콜슨 방법	$u_{xx}(x_i, t^{n+1/2}) = \frac{1}{2} \left(\frac{u_{i+1}^n - 2u_i^n + u_{i-1}^n}{h^2} + \frac{u_{i+1}^{n+1} - 2u_i^{n+1} + u_{i-1}^{n+1}}{h^2} \right)$	$-\alpha u_{i-1}^{n+1} + 2(1 + \alpha)u_i^{n+1} - \alpha u_{i+1}^{n+1} = \alpha u_{i-1}^n + 2(1 - \alpha)u_i^n + \alpha u_{i+1}^n,$

