

EXAMPLE # 21.18 HEAT EQUATION. CRANK –NICOLSON METHOD

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For initial temperature $u(x, 0)$ $0 \leq x \leq 1$

Step 1 : $r = ck / h^2$

Step 2 : Make matrix form $A =$

$\{\{2 + 2r, -r, 0, 0, \dots, 0\}, \{-r, 2 + 2r, -r, 0, 0, \dots, 0\},$
 $\{0, -r, 2 + 2r, -r, 0, 0, \dots, 0\}, \dots, \{0, \dots, 0, -r, 2 + 2r\}\}$

Step 3 : $u[k] = \sin(\pi x)$

Step 4 : $b[i] = u[i - 1] + u[i + 1]$

Step 5 : Linear solution of $A = xb$

Grid table and Graph