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Boundary Conditions.

$$\# T(x, 0) = 3x^2$$

$$\# T(0, t) = 0$$

$$\# T(L, t) = 108$$

If $\delta t = 0.02$ and $\Delta x = 0.3$, $0 \leq t \leq 0.3$
manually, $t_p = 0.3$; $x_p = 6$

Solve for row 1 and row 2,

When $t = 0$ $x = 3x^2$

Hence

$$x_{1,0} = 3 * 0^2 = 0$$

$$x_{1,1} = 3 * 0.3^2 = 0.27$$

$$x_{1,2} = 3 * 0.6^2 = 1.08$$

$$x_{1,3} = 3 * 0.9^2 = 2.43$$

$$x_{1,4} = 3 * 1.2^2 = 4.32$$

$$x_{1,5} = 3 * 1.5^2 = 6.75$$

$$x_{1,6} = 3 * 1.8^2 = 9.72$$

$$x_{1,7} = 3 * 2.1^2 = 13.23$$

$$x_{1,8} = 3 * 2.4^2 = 17.28$$

$$x_{1,9} = 3 * 2.7^2 = 21.87$$

$$x_{1,10} = 3 * 3^2 = 27$$

$$x_{1,11} = 3 * 3.3^2 = 32.67$$

$$x_{1,12} = 3 * 3.6^2 = 38.88$$

$$x_{1,13} = 3 * 3.9^2 = 45.63$$

$$x_{1,14} = 3 * 4.2^2 = 52.92$$

$$x_{1,15} = 3 * 4.5^2 = 60.75$$

$$x_{1,18} = 3 * 4.8^2 = 69.12$$

$$x_{1,18} = 3 * 5.1^2 = 78.03$$

$$x_{1,18} = 3 * 5.4^2 = 87.48$$

$$x_{1,19} = 3 * 5.7^2 = 97.47$$

$$x_{1,20} = 3 * 6^2 = 108$$

row 2, when $t = 0.02$

$$x(2,0) = r * u(i+1,j) + (1-2r) * u_{i,j} + r * (u_{i-1,j})$$

$$\text{where } r = \frac{C \delta t}{h x^2}$$

$$C = 2.2$$

$$x(2,0) = 0$$

$$x(2,1) = 0.48889 * (1.08) + (1-2 * 0.48889) * 0.27 + 0.48889 * (0)$$

$$= 0.5340006$$

$$x(2,2) = 0.48889 * 2.43 + ((1-2) * 0.48889) * 1.08 + 0.48889 * 0.27$$

$$= 1.344$$

$$x(2,3) = 0.48889 * 4.32 + ((1-2) * 0.48889) * 2.43 + 0.48889 * 1.08 = 2.694$$

$$x(2,4) = 0.48889 * 6.75 + ((1-2) * 0.48889) * 4.32 + 0.48889 * 2.43 = 4.584$$

$$x(2,5) = 0.48889 * 9.72 + ((1-2) * 0.48889) * 6.75 + 0.48889 * 4.32 = 7.014$$

$$x(2,6) = 0.48889 * 13.23 + ((1-2) * 0.48889) * 9.72 + 0.48889 * 6.75 = 9.984$$

$$x(2,7) = 0.48889 * 17.28 + ((1-2) * 0.48889) * 13.23 + 0.48889 * 9.72 = 13.490$$

$$x(2,8) = 0.48889 * 21.87 + ((1-2) * 0.48889) * 17.28 + 0.48889 * 13.23 = 17.544$$

$$x(2,9) = 0.48889 * 27 + ((1-2) * 0.48889) * 21.87 + 0.48889 * 17.28 = 22.134$$

$$x(2,10) = 0.48889 * 32.67 + ((1-2) * 0.48889) * 27 + 0.48889 * 21.87 = 27.264$$

$$x(2,11) = 0.48889 * 38.88 + ((1-2) * 0.48889) * 32.67 + 0.48889 * 27 = 32.964$$

$$\chi(2,12) = 0.48889 + 45.63 + (1 - 2 * 0.48889) * 38.88 \\ + 0.48889 * 32.67 = 39.144$$

$$\chi(2,13) = 0.48889 + 52.92 + (1 - 2 * 0.48889) * 45.63 \\ + 0.48889 * 38.88 = 45.894$$

$$\chi(2,14) = 0.48889 + 60.75 + (1 - 2 * 0.48889) * 52.92 \\ + 0.48889 * 45.63 \\ = 53.184$$

$$\chi(2,15) = 0.48889 + 69.12 + (1 - 2 * 0.48889) * 60.75 \\ + 0.48889 * 52.92 = \\ = 61.014$$

$$\chi(2,16) = 0.48889 + 78.03 + (1 - 2 * 0.48889) * 69.12 \\ + 0.48889 * 60.75$$

$$\chi(2,17) = 0.48889 * 87.48 + (1 - 2 * 0.48889) * 78.03 + \\ 0.48889 * 69.12$$

$$\chi(2,18) = 0.48889 * 97.47 + (1 - 2 * 0.48889) * 87.48 + \\ 0.48889 * 78.03$$

$$\chi(2,19) = 0.48889 * 108 + (1 - 2 * 0.48889) * 97.47 \\ + 0.48889 * 87.48$$

$$\chi(2,20) = 97.734$$

$$\chi(2,20) = \underline{\underline{108}}$$