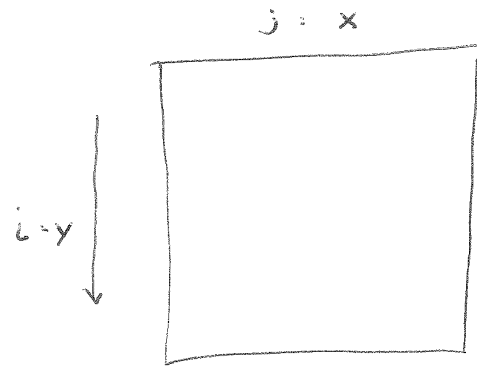
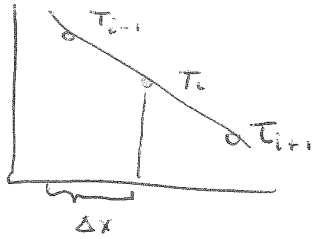


Problem 12.11

Pg. 7

$$0 = \frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2}$$

finite difference of a second derivative



$$\frac{T_i - T_{i-1}}{\Delta x} \quad \frac{T_{i+1} - T_i}{\Delta x} \quad \text{first derivative}$$

$$\frac{\left(\frac{T_{i+1} - T_i}{\Delta x} \right) - \left(\frac{T_i - T_{i-1}}{\Delta x} \right)}{\Delta x} \Rightarrow \frac{T_{i+1} - 2T_i + T_{i-1}}{\Delta x^2}$$

$$0 = \frac{T_{j+1} - 2T_j + T_{j-1}}{\Delta x^2} + \frac{T_{i+1} - 2T_i + T_{i-1}}{\Delta y^2}$$

$$\Delta x^2 = \Delta y^2$$

For T_{12}

$$0 = \frac{T_{22} - 2T_{12} + 100}{\Delta x^2} + \frac{25 - 2T_{12} + T_{11}}{\Delta y^2}$$

For T_{22} $0 = 0 - 2T_{22} + T_{12} + \frac{25 - 2T_{22} + T_{21}}{\Delta y^2}$

For T_{11} $0 = \frac{T_{21} - 2T_{11} + 100}{\Delta x^2} + \frac{T_{12} - 2T_{11} + 75}{\Delta y^2}$

For T_{21} $0 = 0 - 2T_{21} + T_{11} + \frac{T_{22} - 2T_{21} + 75}{\Delta y^2}$

Combine

T_{12}	T_{22}	T_{11}	T_{21}	b vector
-4	1	1	0	-125
1	-4	0	1	-25
1	0	-4	1	-175
0	1	1	-4	-75