$$\tilde{b}_{ij} = \int_{\Gamma_j} \frac{\partial E}{\partial n_x}(x, y_i)\, ds_x =$$

$E(x,y_i) = -\frac{1}{2\pi} \ln|x-y_i|$

$\nabla_x \ln|x-y_i| = \frac{x-y_i}{|x-y_i|^2}$

$$= \int_{\Gamma_j} (\nabla_x E(x,y_i), n_x)\, ds_x =$$

coord. transf.

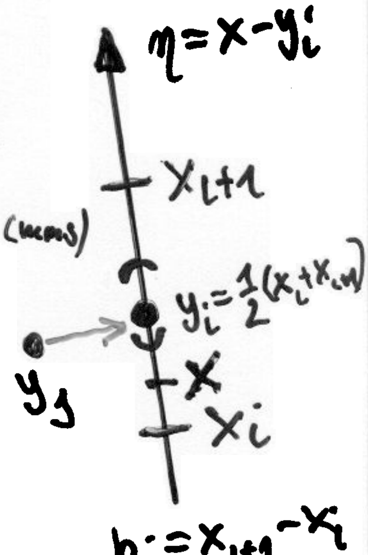
$\eta_1 = \rho \cos\theta$

$\eta_2 = \rho \sin\theta$

$$= -\frac{1}{2\pi} \int_{\Gamma_j} \frac{(x-y_i, n_x)}{|x-y_i|^2}\, ds_x =$$

$$= -\frac{1}{2\pi} \int_{\theta_1}^{\theta_2} \frac{\left(\begin{pmatrix} a \\ \eta_2 \end{pmatrix}, \begin{pmatrix} 1 \\ 0 \end{pmatrix}\right)}{\frac{a^2}{\cos^2\theta}} \frac{a}{\cos^2\theta}\, d\theta$$

$$= -\frac{1}{2\pi} \int_{\theta_1}^{\theta_2} d\theta = -\frac{1}{2\pi}(\theta_2 - \theta_1)$$



2. Case: $i = j = 1, 2, \ldots, n$:

a) $a_{ii} = -\frac{1}{2\pi} \int_{x_i - y_i}^{x_{i+1} - y_i} \ln|\eta|\, d\eta = \int + \int_{(\ )} + \int$ (mms)

weakly singular

b) $y_j \to y_i$ ($\uparrow$)

$\rho_1 = \rho_2 = \frac{h_i}{2}$, $\theta_1 = -\frac{\pi}{2}$, $\theta_2 = \frac{\pi}{2}$

$$a_{ii} = -\frac{1}{2\pi} \frac{h_i}{2}\left[\ln\frac{h_i}{2} - 1 + \ln\frac{h_i}{2} - 1\right] = -\frac{1}{2\pi} h_i \left(\ln\frac{h_i}{2} - 1\right)$$

$$\tilde{b}_{ii} = \int_{\Gamma_i} \frac{\partial E}{\partial n_x}(x, y_i)\, ds_x = \int + \int + \int = ??$$

(mms)

$y_i - \varepsilon \quad y_i \quad y_i + \varepsilon$

strongly singular (Cauchy's mean value)

OR ($\downarrow$)