Marine Hydrodynamics
Assignment 1

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$$\int_C \phi \frac{\partial G}{\partial n} - G\frac{\partial \phi}{\partial n} = -\pi\phi(x,y)$$

$$G = ln(r)$$

$$-\pi\phi(x_0) + \int_C \phi \frac{\partial}{\partial n} ln(r) dl = \int_C ln(r)\frac{\partial \phi}{\partial n} dl$$

$$-\pi\phi(x_0) + \sum_{n=1}^{N} \phi(x_n)(\theta_a - \theta_b) = \int_C ln(r)\frac{\partial \phi}{\partial n} dl$$

$$\frac{\partial \phi}{\partial n_i} = n_i$$

$$\begin{pmatrix} -\pi & (\theta_a-\theta_b)_0 & (\theta_a-\theta_b)_1 & ... \\ (\theta_a-\theta_b)_N & -\pi & (\theta_a-\theta_b)_0 & ... \\ (\theta_a-\theta_b)_{N-1} & (\theta_a-\theta_b)_N & -\pi & ... \\ ... & ... & .... & ... \end{pmatrix} \begin{pmatrix} \phi_0 \\ \phi_1 \\ \phi_2 \\ ... \\ \phi_N \end{pmatrix} = \begin{pmatrix} \int ln(r_0)n_0 dl \\ \int ln(r_1)n_1 dl \\ \int ln(r_2)n_2 dl \\ ... \end{pmatrix}$$

$$\bar{n} = \frac{\frac{x}{a^2}\bar{i} + \frac{y}{b^2}\bar{j}}{(\frac{x}{a^2})^2 + (\frac{y}{b^2})^2}$$

Circle exact potential $\phi = -\frac{a^2 x}{r^2}$ or $\phi = -acos(\theta)$

Exact solution added mass $m_{11} = \rho r_a^2 \pi$