Project I

Presentation: Tuesday, April 3rd ($<$ 10 minutes each)
Report due: Thursday, April 5th

(Total 25 pts: work, 15 pts; presentation, 5 pts; report, 5 pts.)

1. The stream function of a 2D steady incompressible irrotational flow satisfies Laplace equation

$$\psi_{xx} + \psi_{yy} = 0.$$

The configuration is shown in figure 1, where $0 \le x \le 6$m, $0 \le y \le 4$m, OC=DE = 1.5m, and CA=BD=0.25m. The stream function on wall AB is $\psi_0 = 0$, and the stream function on other walls is $\psi_1 = 1$. Please use simple uniform grid, $\Delta x = \Delta y = 0.25$m, to compute the stream function inside the chamber. Use appropriate way to present your results. Compare the following iteration methods and have discussion: (1) Jacobi; (2) G-S; (3) SOR; (4) SLOR; (5) ADI

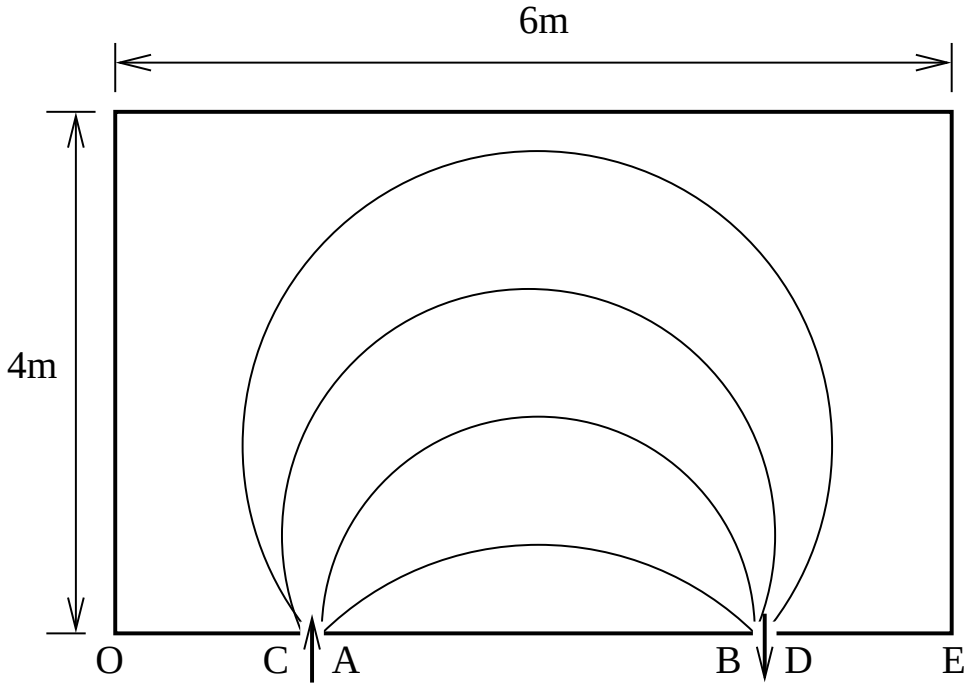

Figure 1: Schematics of the flow configuration

2. Ideas for extra credits (up to 3 pts): a) other shapes; b) other iteration methods (calling fancy subroutines does NOT count); c) source terms; d) multi-grid.