1. 請回答下列有關Inviscid flow的問題。(12%)

(1) 在什麼情況下Inviscid flow的假設是合理的？

(2) 什麼是D'Alembert paradox？

(3) 如何解決(2)之問題？

2. 請回答下列有關邊界層(Boundary Layer)的問題。(16%)

(1) 什麼是邊界層？

(2) 什麼是Prandtl所提出的邊界層理論？

(3) Prandtl的邊界層理論對速度場的控制方程式有何影響？

(4) 邊界層的厚度與什麼有關係？

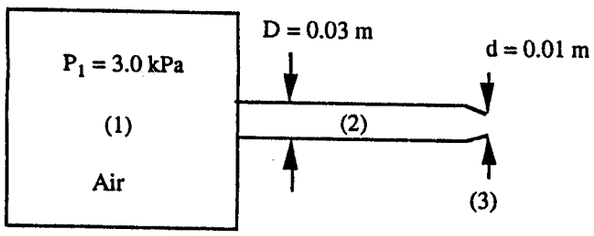
3. 請回答下列有關流線的問題。(12%)

(1) 什麼是Stream line？

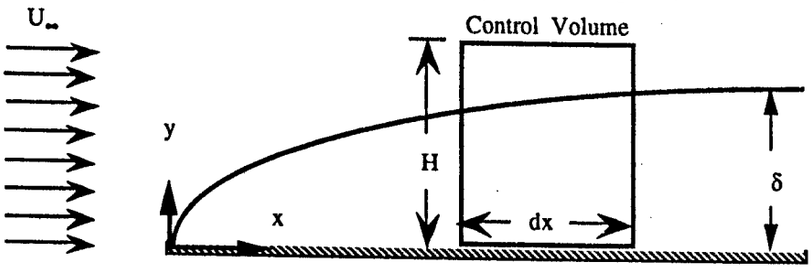
(2) 什麼是Stream function？

(3) What's the relationship between stream function and streamline？

4. Air flows steadily from a tank, through a hose of diameter D = 0.03 m and exits to the atmosphere from a nozzle of diameter d = 0.01 m as shown in the following figure. The pressure in the tank remains constant at 3.0 Kpa (gage) and the atmosphere conditions are standard temperature and pressure. Determine the flowrate and the pressure in the hose. (15%)



5. Consider a steady uniform flow passing over a flat plate, as shown in the following figure. (23%)



(a) Derive the (von Karman) integral momentum equation for this problem by using the control volume shown above.

(b) Derive the expression of d†/x, solving the integral equation by assuming

$$\frac{u}{U_\infty} = a + b\frac{y}{\delta}$$

6. What is the Bernoulli's equation? In what conditions the equation can be applied? (8%)

7. Consider a laminar flow of a parallel plate duct (fully-developed). Derive the expression of velocity distribution. (14%)