1

$$\left\{\begin{array}{l} \cancel{\frac{\partial u}{\partial x}} + \underbrace{\cancel{\frac{\partial v}{\partial y}} = 0}_{v = -v_0} \\ \rho \cancel{u \frac{\partial u}{\partial x}} + \rho v \frac{\partial u}{\partial y} = \cancel{-\frac{\partial p}{\partial x}} + \mu \frac{\partial^2 u}{\partial y^2} \\ \frac{\partial p}{\partial y} = 0 \end{array}\right.$$

$$\boxed{p_0 = 0 \text{ :-)}}$$

$$\boxed{\left\{\begin{array}{l} v = \text{ct} \\ \frac{\partial u}{\partial x} = 0 \end{array}\right.}$$

2

$$\boxed{-\rho v_0 \frac{du}{dy} = \mu \frac{d^2 u}{dy^2}}$$

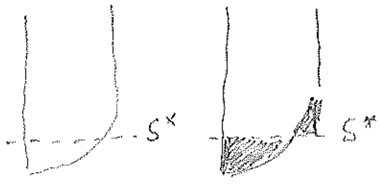
3

$$u = A \exp\left(-\frac{\rho v_0}{\mu} y\right) + B$$

$$u(0) = 0$$
$$u(y \to \infty) = U_\infty$$

$$\boxed{u(y) = U_\infty \left(1 - \exp\left(-\frac{\rho v_0 y}{\mu}\right)\right)}$$

5



ON DEPLACE LA FRONTIERE

4

$$\delta^* = \int_0^\infty 1 - \frac{u(y)}{U_\infty} = \int_0^\infty \exp\left(-\frac{\rho v_0 y}{\mu}\right) = \left[-\frac{\mu}{\rho v_0} \exp\left(-\frac{\rho v_0 y}{\mu}\right)\right]_0^\infty = \frac{\mu}{\rho v_0}$$

$$\boxed{\delta^* = \frac{\mu}{\rho v_0}}$$

6

$$\tau_w = \mu \left.\frac{\partial u}{\partial y}\right|_{y=0} = \cancel{\mu} U_\infty \frac{\rho v_0}{\cancel{\mu}} = \boxed{\rho U_\infty v_0}$$

7

$$C_f = \frac{\tau_w}{\rho U_\infty^2 / 2} = \frac{2 \rho U_\infty v_0}{\rho U_\infty^2} = \boxed{\frac{2 v_0}{U_\infty}} = \boxed{\frac{1}{400}}$$

8

$$\delta(x) = \sqrt{\frac{\mu x}{\rho U_\infty}}$$

ESTIMATION
EQUATIONS
COUCHE LIMITE !

9

$$\frac{U_\infty}{L} \sim \frac{v_0}{\delta}$$

$$\delta = \frac{v_0 L}{U_\infty}$$

$$\frac{v_0 L}{U_\infty} = \sqrt{\frac{\mu L}{\rho U_\infty}}$$

$$\frac{v_0^2 L^{\cancel{2}}}{U_\infty} = \frac{\mu \cancel{L}}{\rho}$$

$$\boxed{L = \frac{\mu U_\infty}{\rho v_0^2}}$$

10

$$dx \left[\rho u \frac{\partial u}{\partial x} + \rho v \overbrace{\frac{\partial u}{\partial y}}^{\frac{\partial v}{\partial x}} = -\frac{\partial p}{\partial x}\right]$$

$$dy \left[\rho u \underbrace{\frac{\partial v}{\partial x}}_{\frac{\partial u}{\partial y}} + \rho v \frac{\partial v}{\partial y} = -\frac{\partial p}{\partial y} - \rho g\right]$$

$$d\left(\rho \frac{u^2}{2}\right) + d\left(\frac{\rho v^2}{2}\right) + d(p) + d(\rho g y) = 0$$

$$\boxed{\rho \frac{u^2}{2} + \rho \frac{v^2}{2} + p + \rho g y = \text{ct}}$$