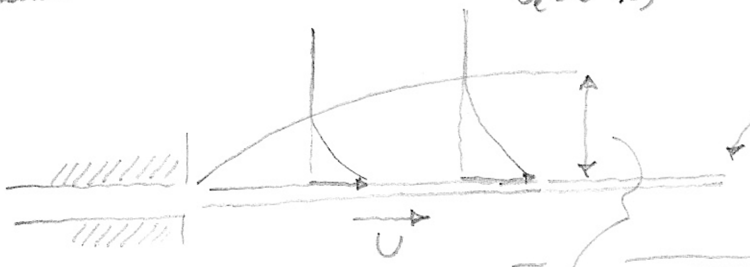
EX 13

$u_e = 0$:-)

1



ON N'ANALYSE PAS LE DEMARRAGE DE L'EXTRUSION

ON SUPPOSE UNE PRODUCTION CONTINUE :-)

$$\boxed{\delta(x) \sim \sqrt{\frac{\nu x}{U}}}$$

2

$$\boxed{\begin{aligned} u(x, y=0) &= U \\ u(x, y=\delta) &= u_e = 0 \end{aligned}}$$

3

$$\int_0^\delta u\frac{\partial u}{\partial x}\,dy + \int_0^\delta v\frac{\partial u}{\partial y}\,dy = \underbrace{\int_0^\delta \nu\frac{\partial^2 u}{\partial y^2}\,dy}$$

$$\underbrace{\nu\frac{\partial u}{\partial y}\bigg|_{\delta}}_{=0} - \underbrace{\nu\frac{\partial u}{\partial y}\bigg|_{0}}_{-\tau_w/\rho}$$

$$\underbrace{\int_0^\delta \frac{\partial}{\partial y}(vu)\,dy}_{=0} - \int_0^\delta \underbrace{\frac{\partial v}{\partial y}}_{= -\frac{\partial u}{\partial x}} u\,dy$$

CAR $v=0$ EN 0
$u=0$ EN δ

CONSERV. LOCALE DE LA MASSE

$$\int_0^\delta 2u\frac{\partial u}{\partial x}\,dy = -\tau_w/\rho$$

$$\frac{d}{dx}\int_0^\delta u^2\,dy = -\tau_w/\rho$$

$$\boxed{-U^2\frac{d\theta}{dx} = \frac{-\tau_w}{\rho}}$$

□

4

$$f(\eta) = a + b\eta + c\eta^2$$

$f(0) = 1$	$a = 1$
$f(1) = 0$	$a + b + c = 0$
$f'(1) = 0$	$b + 2c = 0$

$\longrightarrow$

$$\boxed{\begin{aligned} a &= 1 \\ b &= -2 \\ c &= 1 \end{aligned}}$$

5

$$-U^2\theta = U^2\delta\underbrace{\int_0^1 (1 - 2\eta + \eta^2)^2\,d\eta}$$

$$\int_0^1 1 - 2\eta + \eta^2$$
$$-2\eta + 4\eta^2 - 2\eta^3$$
$$\eta^2 - 2\eta^3 + \eta^4 \; d\eta = \left[\eta - \frac{4\eta^2}{2} + \frac{6\eta^3}{3} - \frac{4\eta^4}{4} + \frac{\eta^5}{5}\right]_0^1$$

$$= \cancel{1} - \cancel{2} + \cancel{2} - \cancel{1} + \frac{1}{5} = \frac{1}{5}$$

$$\boxed{\frac{\theta}{\delta} = -\frac{1}{5}}$$

VALEUR NEGATIVE
CAR C'EST LA COUCHE LIMITE QUI PERD
DE LA QUANTITE DE MVT :-)

6

$$\tau_w = \mu \left.\frac{\partial u}{\partial y}\right|_{y=0}$$

$$= \mu U \underbrace{f'(\eta=0)}_{-2} \frac{1}{\delta} = -\frac{2\mu U}{\delta}$$

$$\boxed{\frac{\Theta}{\delta} = -\frac{1}{5}} \qquad \boxed{\tau_w = -\frac{2\mu U}{\delta}} \longrightarrow \boxed{\tau_w = \frac{2\mu U}{5\Theta}} \quad \square$$

7

$$\frac{d\Theta}{dx} = \frac{1}{\rho U^2} \frac{2\mu U}{5\Theta}$$

$$\Theta \frac{d\Theta}{dx} = \frac{2}{5} \frac{\nu}{U}$$

$$\frac{1}{2} \frac{d}{dx}(\Theta^2) = \frac{2}{5} \frac{\nu}{U}$$

OUI
C'EST NEGATIF
AVEC LA DEFINITION
USUELLE !

$$\boxed{\Theta = -\sqrt{\frac{4}{5} \frac{\nu x}{U}}}$$

$$\boxed{\delta = \sqrt{\frac{20 \nu x}{U}}}$$

8

$$C_f = \frac{-2\mu U}{5\sqrt{\frac{4}{5}\frac{\nu x}{U}}} \frac{2}{\rho U^2} = -\sqrt{\frac{4}{5}} \frac{1}{\sqrt{\frac{U^2}{\nu^2} \frac{\nu x}{U}}}$$

$$\boxed{C_f = -\underbrace{\sqrt{\frac{4}{5}}}_{= -0,8944} \frac{1}{\sqrt{Ux/\nu}}}$$

$= -0,8944$

$(\simeq -0,8875$ PAS SI MAL L'APPROXIMATION :-)