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$\rho = 1200 \text{ kg/m}^3$

$\bar{u} = 1 \text{ m/s}$

$\theta = 30°$

$D = 2\text{cm} = 0.02 \text{ m.}$

have $\ln \tau = \ln k + n \ln du/dy$

(b)

τ	du/dy	$\ln \tau$	$\ln du/dy$
50	10	3.912	2.303
30	5	3.401	1.609

$$n = \text{slope} = \frac{3.912 - 3.401}{2.303 - 1.609}$$

$$= 0.723$$

$$\ln k = \ln \tau - n \ln du/dy$$

$$= 3.912 - (0.723)(2.303)$$

$$= 2.246$$

so $k = 9.451$

(a) apparent $\mu \Rightarrow \mu_{app} = \tau/(du/dy)$

at $du/dy = 10 \text{ s}^{-1} \Rightarrow \mu_{app} = 5 \text{ Pa-s}$

at $du/dy = 5 \text{ s}^{-1} \Rightarrow \mu_{app} = 6 \text{ Pa-s}$

(c) average $\mu_{app} = 5.5$ Pa-s

$$\text{so } Re = \frac{\rho \bar{u} D}{\mu} = \frac{(1200)(1)(0.02)}{(5.5)}$$

$$= 4.36$$

(d)

$$\frac{\Delta P}{\Delta L} + \rho g \frac{\Delta h}{\Delta L} + 2\frac{\tau_w}{r_w} = 0$$

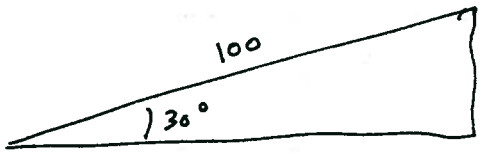
r_w ← radius pipe

$\frac{du}{dy}$ at wall $= 12\ s^{-1}$

$$\text{so } \tau_w = k \left(\frac{du}{dy}\right)^n_{wall}$$

$$= (9.45)(12)^{0.723} = 56.97 \text{ Pa.}$$

$$\text{so } \frac{\Delta P}{100} + \frac{(1200)(9.81)(50)}{100} + \frac{2(56.97)}{(0.02)} = 0$$



$\Delta h = (100)\sin 30° = 50$ m.

get: $\Delta P = -1158300$ Pa

$= -1158$ kPa.