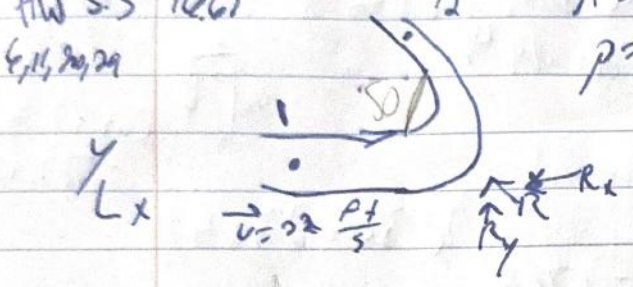
H_2O 140°F deflection = 90 − 50 = 40°

HW 3.3 16.6)
4, 15, 20, 29



$A = 2.9\pi in \cdot .02 ft$

$\rho = 61.5 \frac{lb}{ft^3}$

$Q = vA = 22(.02)$

$Q = .44 \frac{ft^3}{s}$

$\Sigma F_x = \rho Q(v_{2x} - v_{1x})$

$\Sigma F_y = \rho Q(v_{2y} - v_{1y})$

$\sin 50 \frac{R_y}{22} = v_{0y} = 5.77 \frac{ft}{s}$

$\cos 50 = \frac{v_{2x}}{22} = v_{2x} = 21.23 \frac{ft}{s}$

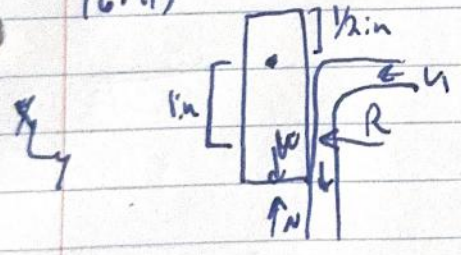
$R_x = 61.5 \frac{lb}{ft^3}(.44 ft^3)(21.23 \frac{ft}{s} - 22 \frac{ft}{s})$

$R_x = 20.84 \frac{lb}{ft \cdot s}$

$R_y = 61.5 \frac{lb}{ft^3}(.44) - 5.77 \frac{ft}{s}$

$R_y = 156.14 \frac{lb}{ft \cdot s}$

16.11)



1 in sch 40

$Q = 100 gal/min$

$= .223 ft^3/s$

$Q = .0447$

$A = \frac{\pi D^2}{4}$ $A = .006 ft^2$

$V = \frac{Q}{A} = \frac{.223}{.006}$

$V = 37.17 ft/s$

$\Sigma F_x = \rho Q(v_{2x} - v_{1x})$

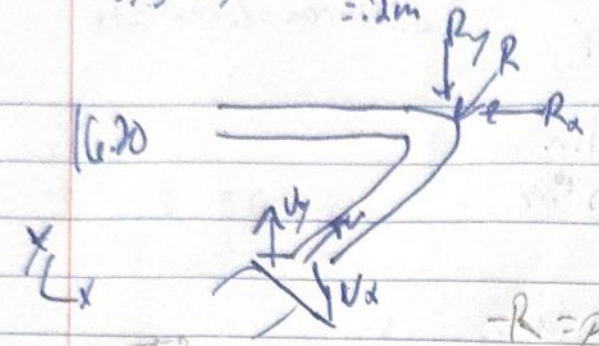
$-R_x = 194(.223)(-37.166)$

$R_x = 16.08$

↳ since $T_{spring} = R_x$

$\Rightarrow T_{spring} = 16.08$

$V = 30 \frac{m}{s}$ $d = 200mm = .2m$ $\rho = 100 \frac{kg}{m^3}$



$Q = 30 \frac{m}{s} (.0314 m^2)$

$Q = .94 \frac{m^3}{s}$

$\sin 15 \frac{V_y}{30}$

$= (8.5 \frac{m}{s}$

$\cos 15 = \frac{V_x}{30}$

$= 28.8 \frac{m}{s}$

$A = \frac{\pi D^2}{4}$

$A = .0314 m^2$

$-R = \rho Q (V_2 - V_1)$

$-R_x = 100 \frac{kg}{m^3} (.94 \frac{m^3}{s}) (-30 \frac{m}{s} + 28.8 \frac{m}{s})$

$R_x = 6768 N$

$-R_y = 100 \frac{kg}{m^3} (.94 \frac{m^3}{s}) (-19.5)$

$R_y = 18336 N$

$R = \sqrt{18336^2 + 6768^2}$

$R = 19539.6 N$

$V = 30 \cos 15 = 18 \frac{m}{s}$

$-R_x = 100 (.94) (-14 + 28.8)$

$R_x = 4512 N$

$-R_y = 100 (.94) - 19.5$

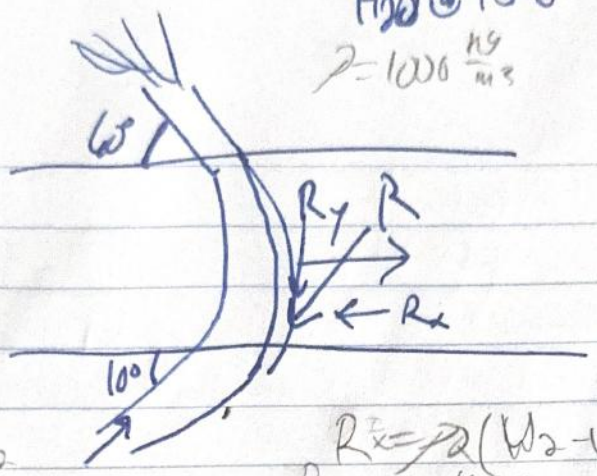
$R_y = 18330$

$R = \sqrt{1833^2 + 4512^2}$

$R = 18877.2 N$

H_2O @ 15°C $d = 7.5mm = .0075m$ $V = 25 m/s$

$\rho = 1000 \frac{kg}{m^3}$ $r = .2m$ $A = \frac{\pi D^2}{4} = 4.4E^{-5} m^2$



$Q = VA$

$Q = 25 \frac{m}{s}(4.4E^{-5} m^2) = .0011 \frac{m^3}{s}$

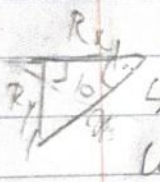
$\Sigma F_x =$

$W_2 = \rho Q v_2$

$R_x = \rho Q (W_2 - W_1)$

$-R_x = 1000 \frac{kg}{m}(.0011 \frac{m^3}{s})(12 < -24.6)$

$R_x = 13.31 N$



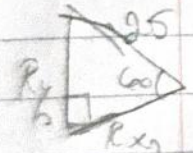
$\sin 60 \frac{R_y}{R} \rightarrow 14.63 = R_{y1}$

$\cos 60 \frac{R_x}{R} \rightarrow 24.6 = R_x$

R_y

$-R_y = 1000 \frac{kg}{m^3}(.0011 \frac{m^3}{s})(21.6 - 4.3)$

$R_y = 19.03$



$\sin 60 \frac{R_y}{R} \rightarrow 21.6 = R_{y2}$

$\cos 60 \frac{R_x}{R} \rightarrow 12.5 = R_{x2}$

$R = \sqrt{R_x^2 + R_y^2}$

$R = 23.22$