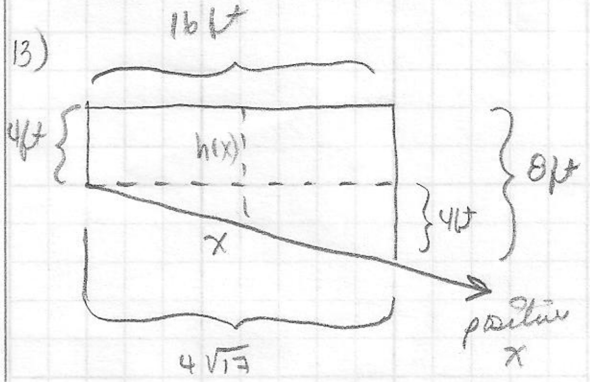
P. 495

13)



$\sqrt{(16)^2+(4)^2}$

$\sqrt{256+16}$

$\sqrt{272}$

$4\sqrt{17}$

$$\frac{h(x)-4}{4} = \frac{x}{4\sqrt{17}} \qquad w(x) = 10$$

$$h(x)-4 = \frac{4x}{4\sqrt{17}} \qquad \sec\theta = \frac{4\sqrt{17}}{16} = \frac{\sqrt{17}}{4}$$

$$h(x) = \frac{x}{\sqrt{17}} + 4$$

$\therefore$ density $h(x)$ $w(x)$ angle w/vertical

$$F = \int_0^{4\sqrt{17}} \rho\left(\frac{x}{\sqrt{17}}+4\right)(10)\sec\theta\, dy$$

$$= \int_0^{4\sqrt{17}} 62.4\left(\frac{x}{\sqrt{17}}+4\right)(10)\left(\frac{\sqrt{17}}{4}\right) dw$$

$$= 156\sqrt{17}\int_0^{4\sqrt{17}} \left(\frac{x}{\sqrt{17}}+4\right) dy$$

$$= 156\sqrt{17}\left[\frac{x^2}{2\sqrt{17}} + 4x\right]_0^{4\sqrt{17}}$$

$$= 156\sqrt{17}\left[8\sqrt{17}+16\sqrt{17}\right]$$

$$= 156\sqrt{17}\left[24\sqrt{17}\right]$$

$$= \underline{63648 \text{ lb}}$$

14) reduce force by $\frac{1}{2}$ i.e. $F_1 = \frac{F}{2}$

$h(x) = \frac{x}{\sqrt{17}} + 4 - y$ ← the drop in water level

$$\therefore F_1 = \int_0^{4\sqrt{17}} 62.4\left(\frac{x}{\sqrt{17}}+4-y\right)(10)\left(\frac{\sqrt{17}}{4}\right) dy$$

but

$$F_1 = \int_0^{4\sqrt{17}} 62.4\left(\frac{x}{\sqrt{17}}+4\right)(10)\left(\frac{\sqrt{17}}{4}\right) dy - \int_0^{4\sqrt{17}} y(62.4)(10)\left(\frac{\sqrt{17}}{4}\right) dy$$

$$F_1 = F - y\int_0^{4\sqrt{17}} 156\sqrt{17}\, dy$$

$$= 63648 - 10608y$$

now $F_1 = \frac{F}{2}$ so

$$63648 - 10608y = \frac{63648}{2}$$

$$\underline{y = 3 \text{ ft}}$$