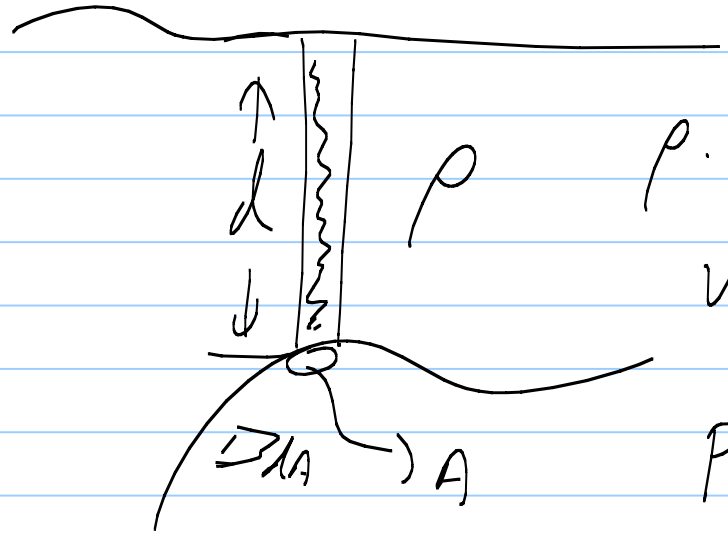
EGR180 6/23

Note Title 6/23/2009



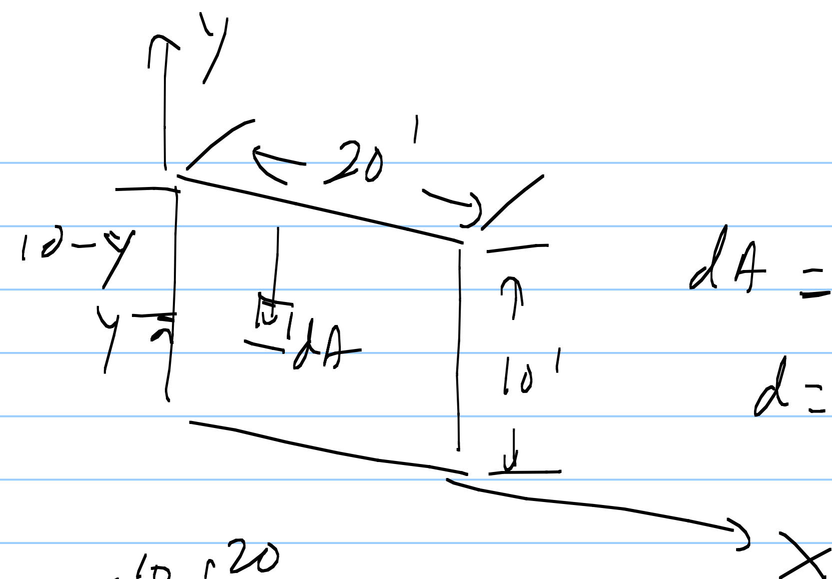
$$\rho \cdot V = F = \rho d A$$

$$V = d A$$

$$P = \frac{F}{A} = \rho d$$

$$dF = P dA$$

$$F = \int_S P dA$$



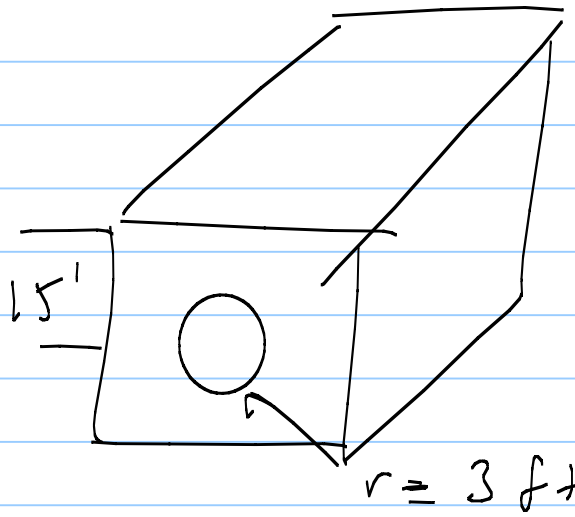
$dA = dx\,dy$

$d = 10 - y$

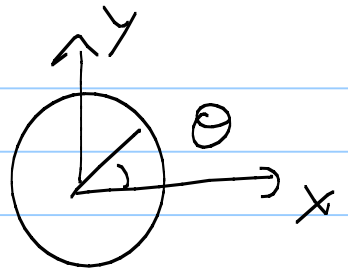
$$F = \int_0^{10}\int_0^{20} 62.4(10-y)\,dx\,dy = 1248\int_0^{10}(10-y)\,dy$$

$$= 1248\left[10y - \frac{y^2}{2}\right]_0^{10} = 1248\left[100-50\right] =$$

62,400 lbs



$$F = \iint_A \rho d \, dA$$



$$F = \int_0^{2\pi} \int_0^3 \underline{62.4}[15 - \underline{r \sin\theta}] \; r \, dr \, d\theta$$

$$d = 15 - r\sin\theta$$

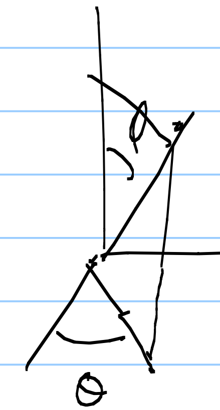
$$dA = r \, dr \, d\theta$$

$$= 124.8 \cdot 15\pi \int_0^3 r \, dr$$

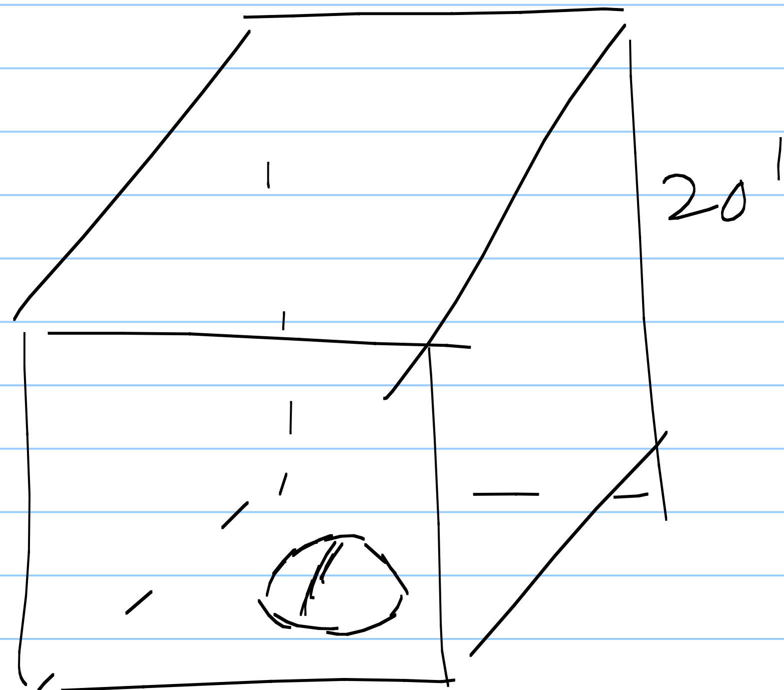
$$= 1872\pi \left. \frac{r^2}{2} \right|_0^3 = 8424\pi \text{ lbs}$$

$$\doteq 26,460 \text{ lbs}$$

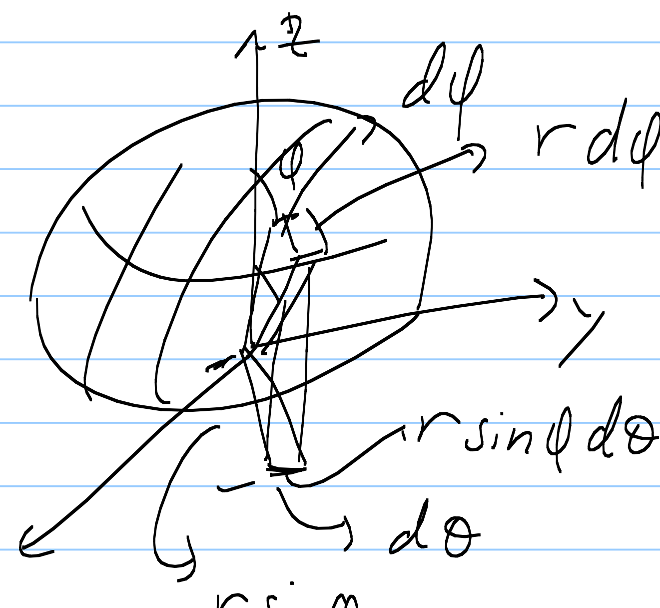
$z = r\cos\varphi$



$F = \iint_A \rho\, d\, dA$



radius = 6'



$\varphi \in [0, \frac{\pi}{2}]$

$\theta \in [0, 2\pi]$

$d = 20 - r\cos\varphi$

$dA = r^2 \sin\varphi\, d\varphi\, d\theta$

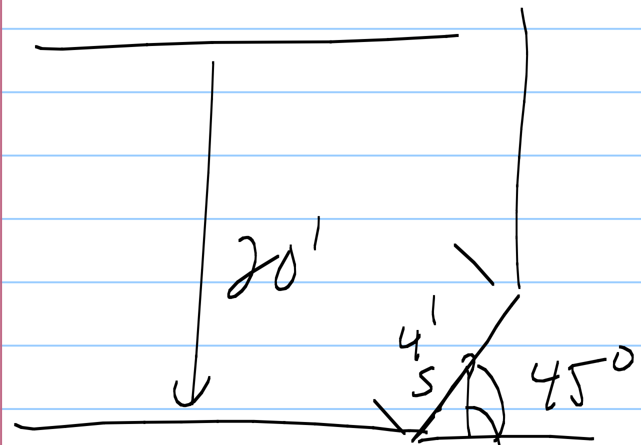
$$F = \int_0^{2\pi} \int_0^{\pi/2} \rho\left[20 - r\cos\phi\right] r^2 \sin\phi \, d\phi \, d\theta$$

$$= 2\pi\rho r^2 \int_0^{\pi/2} \left[20\sin\phi - r\cos\phi\sin\phi\right] d\phi$$

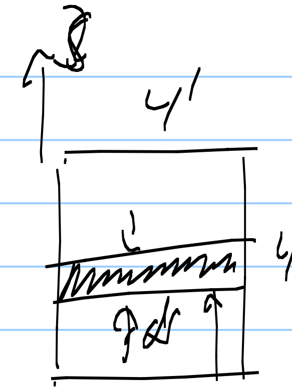
$$= 2\pi\rho r^2 \left[20\cos\phi \Big|_{\pi/2}^{0} - r\frac{\sin^2\phi}{2} \Big|_0^{\pi/2} \right]$$

$$= 2\pi\rho r^2 \left[20 - \frac{r}{2}\right] = 40\pi\rho r^2 - \pi\rho r^3$$

$$= 240{,}000 \text{ lbs}$$



$\to s\sin(45) = s/\sqrt{2}$

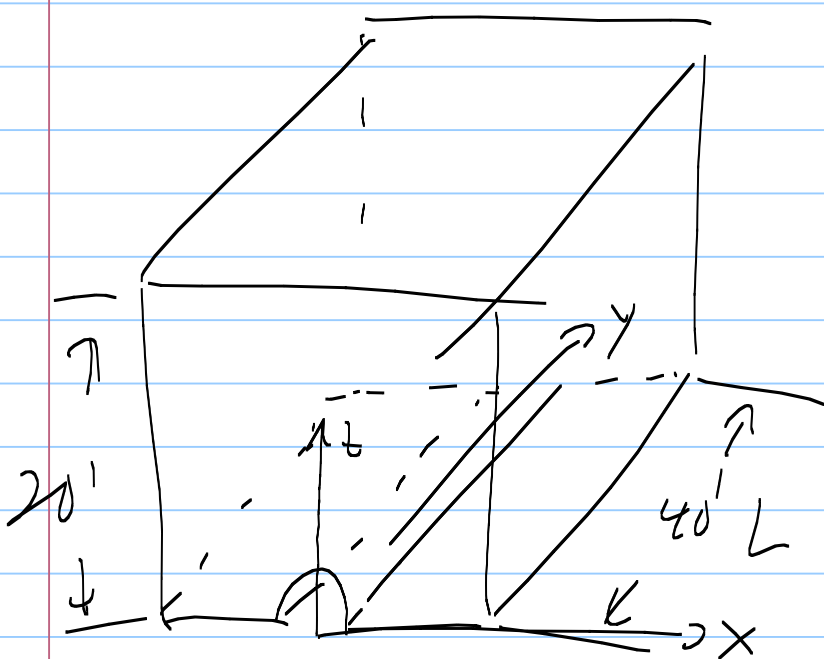


$dA = 4\,ds$

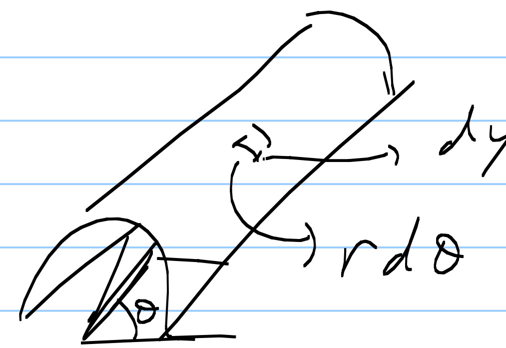
$d = 20 - s/\sqrt{2}$

$$F = \int_0^4 \rho\left(20 - s/\sqrt{2}\right) 4\,ds = 4\rho\int_0^4 \left(20 - s/\sqrt{2}\right) ds$$

$$= 4\rho\left(80 - \frac{s^2}{2\sqrt{2}}\Big|_0^4\right) = 4\rho\left[80 - 4\sqrt{2}\right] = 18600 \text{ lbs}$$



radius = 4'



$$d = d_0 - r\sin\theta$$

$$F = \int_0^{\pi}\int_0^{L} \rho\,[d_0 - r\sin\theta]\, r\,dy\,d\theta$$

$$= \rho L r \int_0^{\pi} (d_0 - r\sin\theta)\,d\theta$$

$$= \rho L r\,[d_0\pi - 2r]$$

F = 547,000 lbs
= 274 Tons