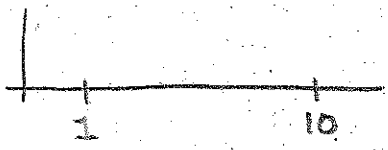
Lesson 16 HW | (6.4) 3, 5, 15, 19, 21

3) $F = \frac{5}{x^2}$ (lb)



$W = F \cdot D$

$= \int_1^{10} \frac{5}{x^2}\,dx = \int_1^{10} 5x^{-2}\,dx = 5\left(-x^{-1}\right)\Big|_1^{10} = 5\left(-\frac{1}{10} - \left(-\frac{1}{1}\right)\right)$

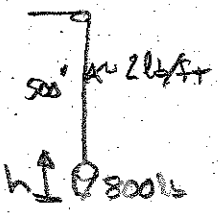
$= 5\left(\frac{9}{10}\right) = \boxed{4.5 \text{ ft-lb}}$

5) $W = F \cdot D$

$\frac{1}{2}(6)(4)\,30 \quad \boxed{120}$

$= \boxed{180 \text{ N-m}}$

15)



$F = (500-h)(\text{ft})\left(2\frac{\text{lb}}{\text{ft}}\right) + 800 \text{ lb}$

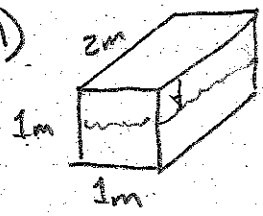
$(1000 - 2h + 800)$ lb

$W = Fd = \int_0^{500} (1800 - 2h)\,dh$

$= \left(1800h - h^2\right)_0^{500} = 1800(500) - (500)^2 =$

$\boxed{W = 650000 \text{ ft-lb}}$

19)



mass of 'slice' $= (2\text{m})(1\text{m})(dh)\left(1000\frac{\text{kg}}{\text{m}^3}\right)$

$= 2000\,dh\,(\text{kg})$

Force $= ma = \left(9.8\frac{\text{m}}{\text{s}^2}\right)(2000\,dh)\text{kg}$

$F = 19600\,dh\,(\text{N})$

$W = F \cdot D$

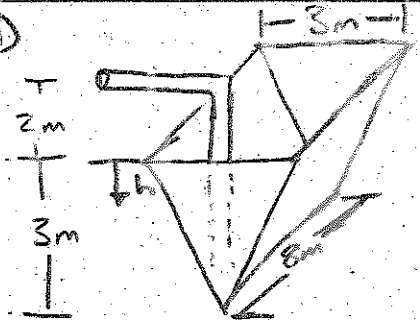
$= \int_0^{.5\text{m}} (19600\,dh)(h) = 19600 \int_0^{0.5} h\,dh$

$= 19600 \left.\frac{h^2}{2}\right|_0^{.5} = 9800(.25) = 2450 \text{ N-m}$

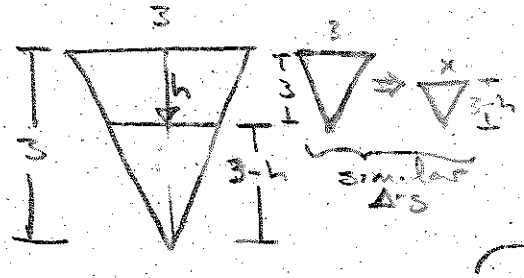
$\boxed{W = 2450 \text{ J}}$

21)

(21)



$\#^{o}H = 62.5\ lb/ft^3$



$$\frac{x}{3-h} = \frac{3}{3}$$

$$x = 3-h$$

$$\text{mass} = \text{volume}(m^3) \cdot a$$

$$F = ma = (8(3-h)\,dh)\left(1000\frac{kg}{m^3}\right)\left(9.8\frac{m}{s^2}\right)$$

$$\text{Distance} = (2+h)(m)$$

$$W = FD = 78400\int_0^3 (3-h)(2+h)\,dh$$

$$\int_0^3 (6+h-h^2)\,dh$$

$$\left(6h + \frac{h^2}{2} - \frac{h^3}{3}\right)\Big|_0^3$$

$$78400\left(18 + \frac{9}{2} - 9\right)$$

$$\left(9+\frac{9}{2}\right)$$

$$78400\,(13.5)$$

$$W = 1058400\ N\cdot m$$

$$W \approx 1.06 \times 10^6\ J$$