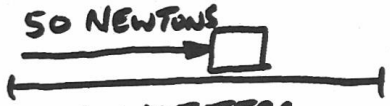
7.5 WORK

$W = F \cdot d$

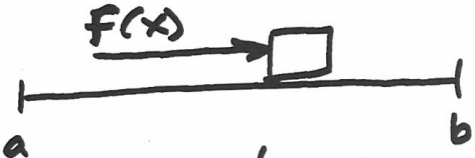
$W = 50N \cdot 10m$



1 NM = 1 J (JOULE)

WORK = 500 NEWTON METERS

$$W = \int_a^b f(x)\,dx$$



LIKE 1-4

LET $f(x) = x^2$ NEWTONS $a = 2m$ $b = 10m$

$$W = \int_2^{10} x^2\,dx = \frac{x^3}{3}\Big]_2^{10} = \frac{10^3}{3} - \frac{2^3}{3} = 330.\bar{6}\ nM$$

p.401 EXAMPLE 1 — 22 NEWTON LEAKY BUCKET RAISED 20 METERS, ROPE WEIGHS .4N/m
70 NEWTONS OF WATER INITIALLY (0,70)
0 NEWTONS OF WATER AFTER LEAKING (20,0)
HOW MUCH WORK IS USED IN LIFTING BUCKET WATER & ROPE?

a) $W_{BUCKET} = F \cdot d = 22N \cdot 20m = 440$ JOULES

b) $W_{WATER} = \int_0^{20} (70 - 3.5x)\,dx = 700$ JOULES (0,20)

c) $W_{ROPE} = \int_0^{20} .4(20 - x)\,dx = 80$ JOULES (20,0)

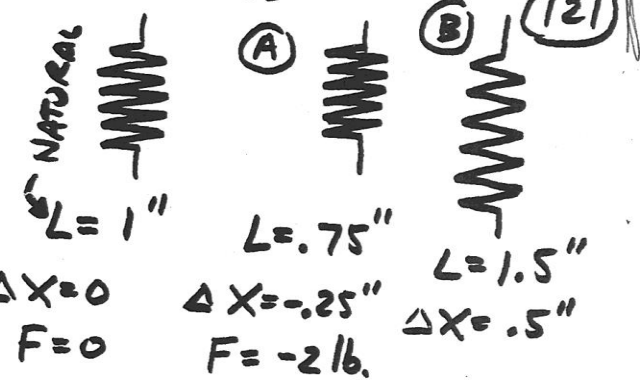
d) TOTAL WORK = 440 J + 700 J + 80 J = 1220 J

HWORK p. 407-408 → ~~1-3, 11~~ 1-4 F = force

NOTE $F(x) \neq \int f(x)\,dx$ IN THIS SECTION

Hookes Law For Springs

$F(x) = kx$



(A) Find k

$F = kx$

$-2\text{ lb.} = k(-.25'')$

$k = \frac{8\text{ lb}}{\text{INCH}}$

(B) Find F when $L = 1.5''$

$F = kx$

$F = 8x$

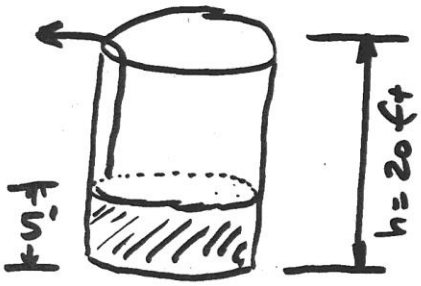
$F = 8\frac{\text{lb}}{\text{INCH}}(.5\text{ INCH}) = 4\text{ lb.}$

(C) How Much Work Is Done To Stretch The Spring From 1 To 1.5 Inches?

$$W = \int_a^b f(x)\,dx = \int_0^{.5} 8x\,dx = 4x^2\Big]_0^{.5} = 1\text{ INCH-LB}$$

Homework p. 408 → 8-10

EMPTYING A TANK



$r = 4$ ft $h = 20$ ft

WATER DENSITY = $\rho = 62.4 \frac{lb}{ft^3}$

WATER DEPTH = 5 ft.

HOW MUCH WORK TO PUMP THE WATER UP AND OUT OF THE TANK?

$$W = \int_a^b \rho A Y \, dY$$

a ← BOTTOM DEPTH

A = CROSS-SECTIONAL AREA $= \pi r^2$

$$W = \int_{15}^{20} 62.4 \, \pi \, 4^2 \, Y \, dY = \boxed{274,449 \text{ ft-lb}}$$

15 ← TOP DEPTH

HOMEWORK p. 409 → 17a, 18

REVIEW FOR TEST

p. 413-415 → 9, 12, 19, 21, 34, 39

ALSO

p. 371 → 10, 12, 13

p. 399 → 2, 10

p. 408 → 18