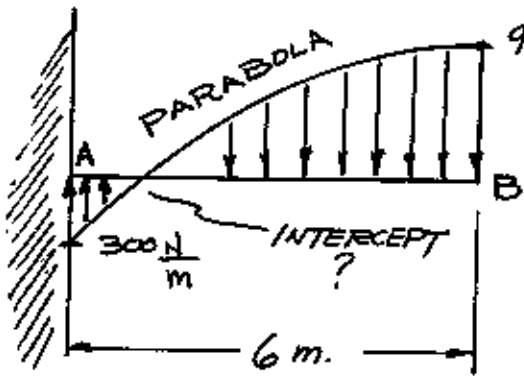
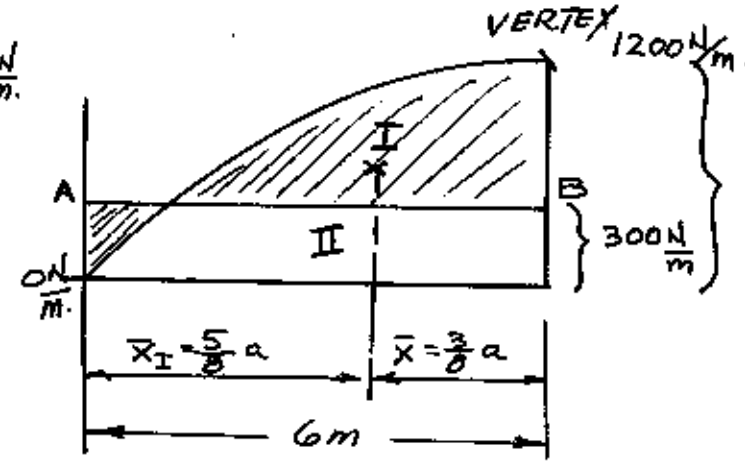
MECH 234 + 235
DISTRIBUTED LOAD

PROB. 5-82
p. 246





CANNOT DETERMINE X-INTERCEPT BY PROPORTIONS BECAUSE NOT A LINEAR RELATION

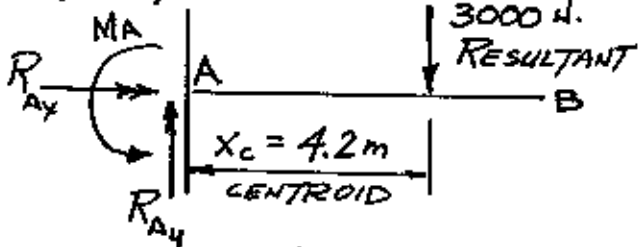
∴ USE FULL AREA OF PARABOLA WITH $h = 1200 \frac{N}{m}$ & SUBTRACT RECT. AREA WITH $h = 300 \frac{N}{m}$.

Refer to p. 215
SEMI-PARABOLIC AREA (UPSIDE DOWN) or rotated 180°, note $\bar{x}$ from vertex.

SECT.	AREA	CENTROID
I.	$\frac{2}{3}ah = \frac{2}{3}(6m)(1200\frac{N}{m}) = 4800N.$	$\bar{x}_I = \frac{3}{8}a$ from vertex $= \frac{3}{8}(6m)$ $= 2.25m$ ∴ from A $= 3.75m.$
− II.	$bh = (6m)(300\frac{N}{m}) = -1800N.$	$\bar{x}_{II} = \frac{1}{2}a = 3m.$
	RESULTANT $= \Sigma A = 3000N.$	

$$x_c = \frac{\Sigma A\bar{x}}{\Sigma A} = \frac{(4800)(3.75m) - (1800N)(3m)}{3000N.} = \boxed{4.2m = x_c}$$
PT. OF APPLICATION.

REACTIONS:



$\Sigma F_x = 0 = R_{Ax}$ ✓

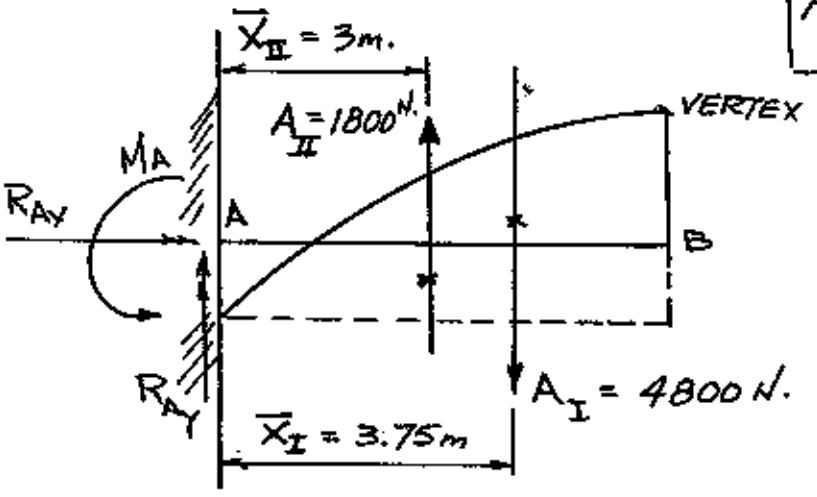
$\Sigma F_y = 0 = -3000N + R_{Ay}$

$\boxed{R_{Ay} = 3000N \uparrow}$

$$\Sigma M_A^{\circlearrowleft} = 0 = M_A - (3000^N)(4.2m) = \boxed{12{,}600\ N\text{-}m. = M_A \text{ CCW}}$$

SEE NEXT PAGE for ALTERNATE.

PROB. 5-82 cont'd.



SEPARATE AREAS, SEPARATE RESULTANT FORCES.

$\Sigma F_x = 0 = R_{AX}$

$\Sigma F_y = 0 = R_{AY} + 1800^{N} - 4800^{N}$ $\therefore$ $\boxed{R_{AY} = 3000 N. \uparrow}$

$\Sigma M_A = 0 = \overset{\curvearrowleft}{M_A} + (1800^{N}\overset{\curvearrowleft}{)}(3m.) - (4800^{N}\overset{\curvearrowright}{)}(3.75m.)$

$\boxed{M_A = 12,600 N\text{-}m. \text{ CCW}}$

NOTE: This is First Moment of Area.