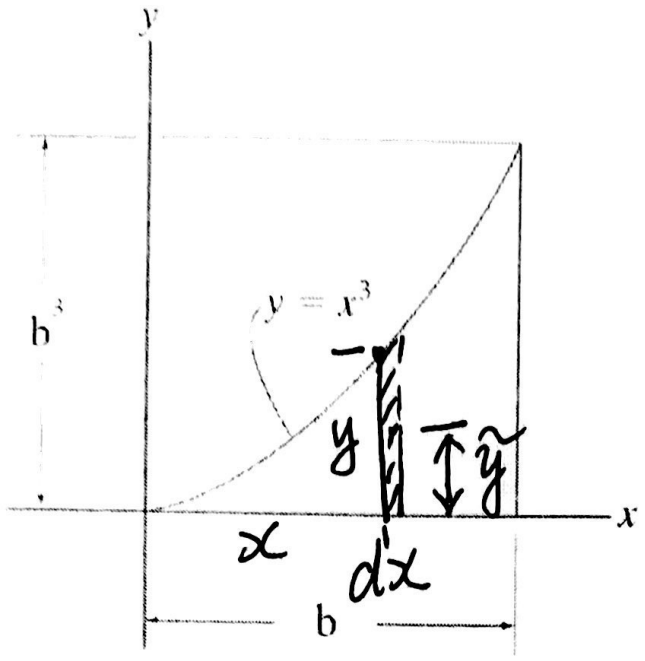
1 Calculate the *Centroidal location* for the shaded area shown measured from the x-axis using the *integration method*, in inches, to one decimal place. b =2 inches



$$dA = y\,dx = x^3 dx$$

$$\tilde{y} = \frac{y}{2} = \frac{x^3}{2}$$

$$\bar{y} = \frac{\int_A \tilde{y}\,dA}{\int_A dA}$$

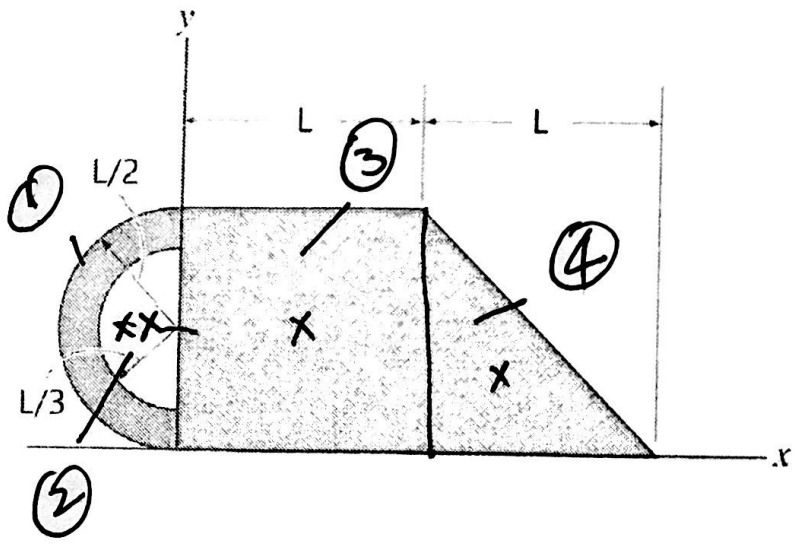
$$= \frac{\int_0^2 \frac{x^3}{2}(x^3)\,dx}{\int_0^2 x^3\,dx}$$

$$= \frac{\frac{1}{2}\frac{x^7}{7}\Big|_0^2}{\frac{1}{4}x^4\Big|_0^2}$$

$$= \frac{2}{7} \times 8 = 2.3m$$

$$\boxed{\bar{y} = 2.3m}$$

2 If L=3 inches, calculate the centroidal distance **X Bar** (measured from the **y-axis**) using the *Composite Bodies Method*, and show your value to two decimal places.



shapes	A_i (inch^2)	$\tilde{x}_i$ (in)	$A_i\tilde{x}_i$ (inch^3)
①	7.07 in^2/2	-0.637	-2.25
②	-3.14/2	-0.424	1.333/2=0.667
③	9	4.5	13.5
④	4.5	3+1=4	18
Σ	15.465		29.917

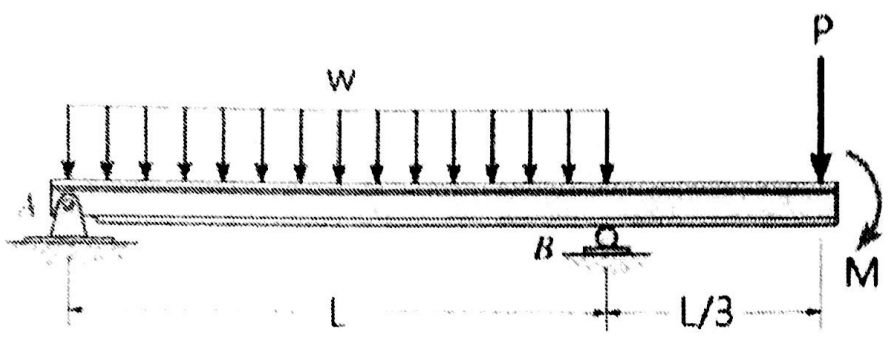
$$\bar{x} = \frac{\Sigma A_i \bar{x}_i}{\Sigma A_i}$$

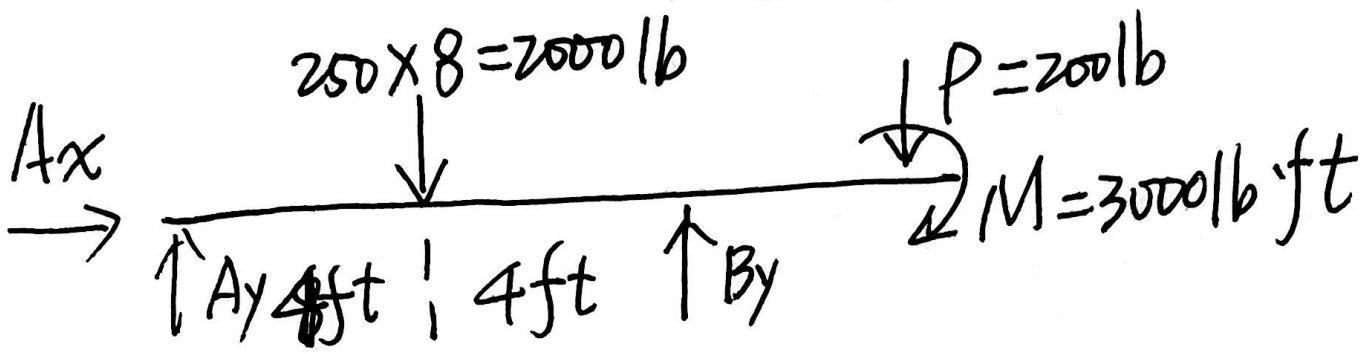
$$= \frac{29.917}{15.465} = 1.93 in$$

$$\boxed{\bar{x} = 1.93in}$$

3 Calculate the **vertical support reaction** in lbs at the roller **at B** as **a whole number**. Sign Convention: Up is positive and Down is negative.

P = 200 lb; W = 250 lb/ft; M = 3000lb-ft L = 8ft





$\circlearrowleft \Sigma M_A(\bar{F}) = 0$

$+By \times 8 - 2000 \times 4 - 200 \times \left(\frac{8}{3}+8\right) + 3000 = 0$

$By = 1642lb \ (\uparrow)$