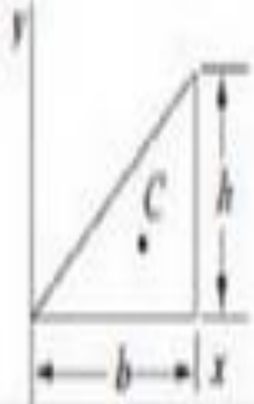
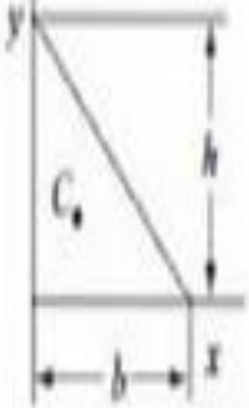
Ixy For right-angle Case-1

Figure	Area & Centroid	Area Moment of Inertia	(Radius of Gyration)^2	Product of Inertia
	$A = bh/2$ $x_c = 2b/3$ $y_c = h/3$	$I_{x_c} = bh^3/36$ $I_{y_c} = b^3h/36$ $I_x = bh^3/12$ $I_y = b^3h/4$	$r^2_{x_c} = h^2/18$ $r^2_{y_c} = b^2/18$ $r^2_x = h^2/6$ $r^2_y = b^2/2$	$I_{x_c y_c} = Abh/36 = b^2h^2/72$ $I_{xy} = Abh/4 = b^2h^2/8$
	$A = bh/2$ $x_c = b/3$ $y_c = h/3$	$I_{x_c} = bh^3/36$ $I_{y_c} = b^3h/36$ $I_x = bh^3/12$ $I_y = b^3h/12$	$r^2_{x_c} = h^2/18$ $r^2_{y_c} = b^2/18$ $r^2_x = h^2/6$ $r^2_y = b^2/6$	$I_{x_c y_c} = -Abh/36 = -b^2h^2/72$ $I_{xy} = Abh/12 = b^2h^2/24$

Case -1

Our Case

$-\frac{b^2h^2}{72}$

$\frac{b^2h^2}{24}$

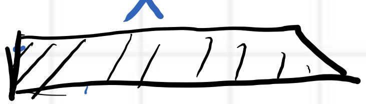
A

Cg

left Corner

I_{xy} For Right Triangle

We will use a horizontal strip, width = dy, Length = x



$x_{distance} = \frac{x}{2}$

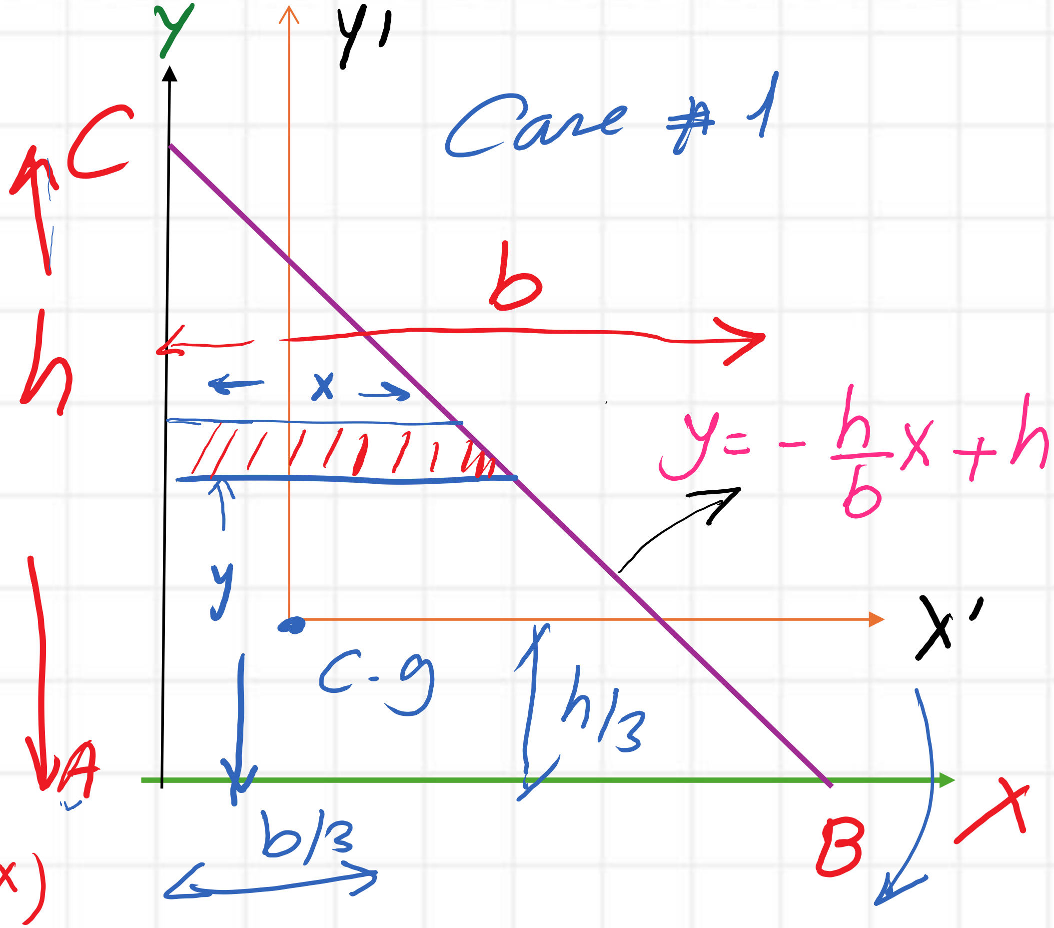
$y_{distance} = y$ xcg of strip

$I_{xy} = \int dA \cdot \left(\frac{x}{2}\right) \cdot y$

$dA = x \cdot dy$

$I_{xy} = \int_0^h x \cdot dy \left(\frac{x}{2}\right)(y)$

$I_{xy} = \int_0^h x^2 \frac{y}{2} \, dy$



$(y - h) = \left(-\frac{h}{b}x\right)$

$b(y-h) = -hx$

$x = \frac{b(y-h)}{-h}$

$x^2 = \frac{1}{h^2} b^2 (y^2 - 2yh + h^2)$

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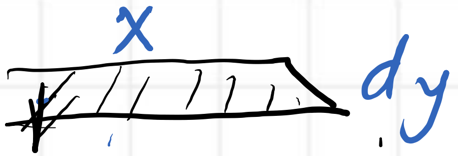
I_{xy} For Right Triangle Contd



$$x^2 = \frac{1}{h^2} b^2 (y^2 - 2yh + h^2)$$

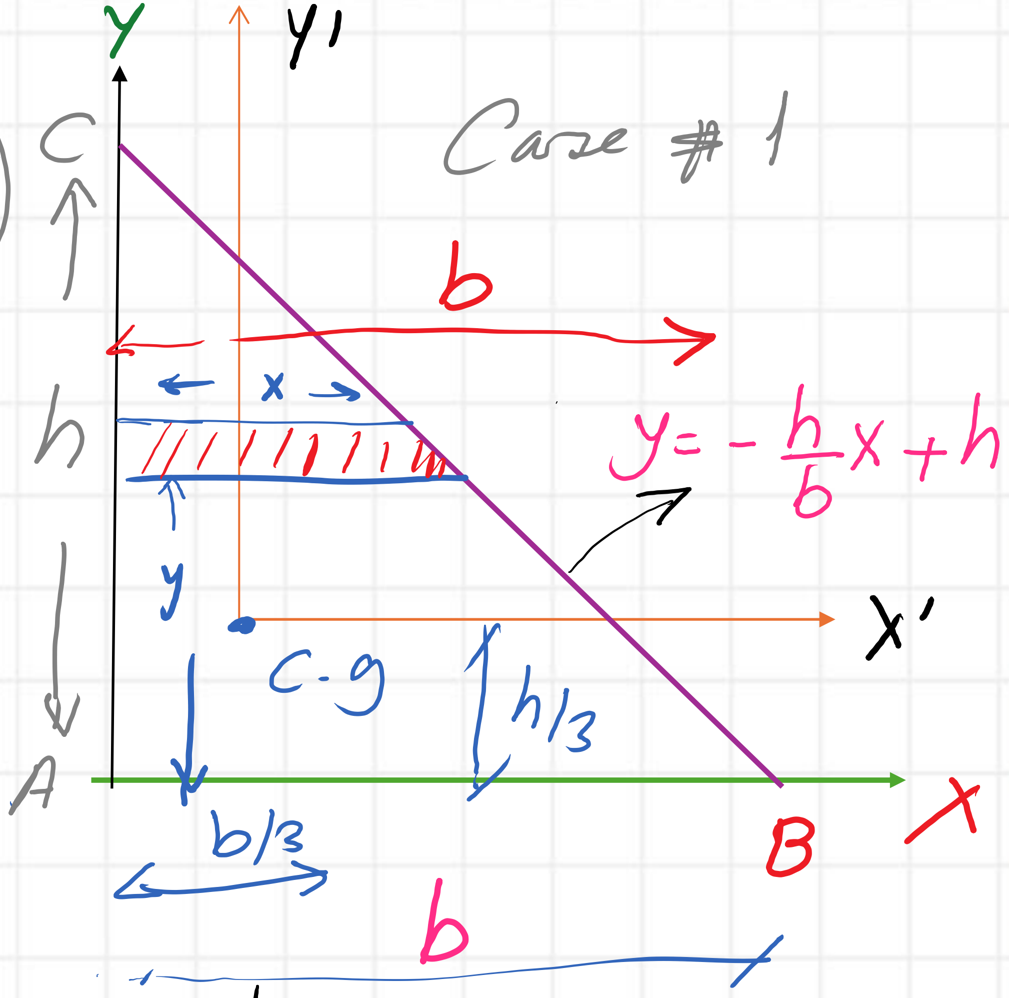
$$I_{xy} = \int \frac{x^2}{2} \cdot y \, dy$$

$$I_{xy} = \frac{1}{2h^2} \int_0^h (b^2h^2 - 2b^2hy + b^2y^2) y \, dy$$

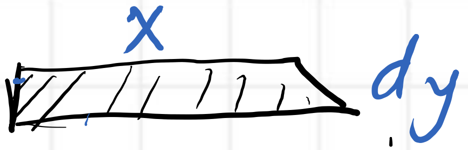
$$I_{xy} = \frac{1}{2h^2} \int_0^h (b^2h^2 y \, dy - 2b^2 h y^2 dy + b^2 y^3 dy)$$

$$I_{xy} = \frac{1}{2h^2} \left[b^2h^2 \frac{y^2}{2} - 2b^2h \frac{y^3}{3} + b^2 \frac{y^4}{4} \right]_0^h$$

$$= \frac{1}{2h^2} \left[\frac{b^2h^4}{2} - \frac{2}{3} b^2h^4 + \frac{b^2}{4} h^4 \right]$$



I_{xy} For Right Triangle Contd

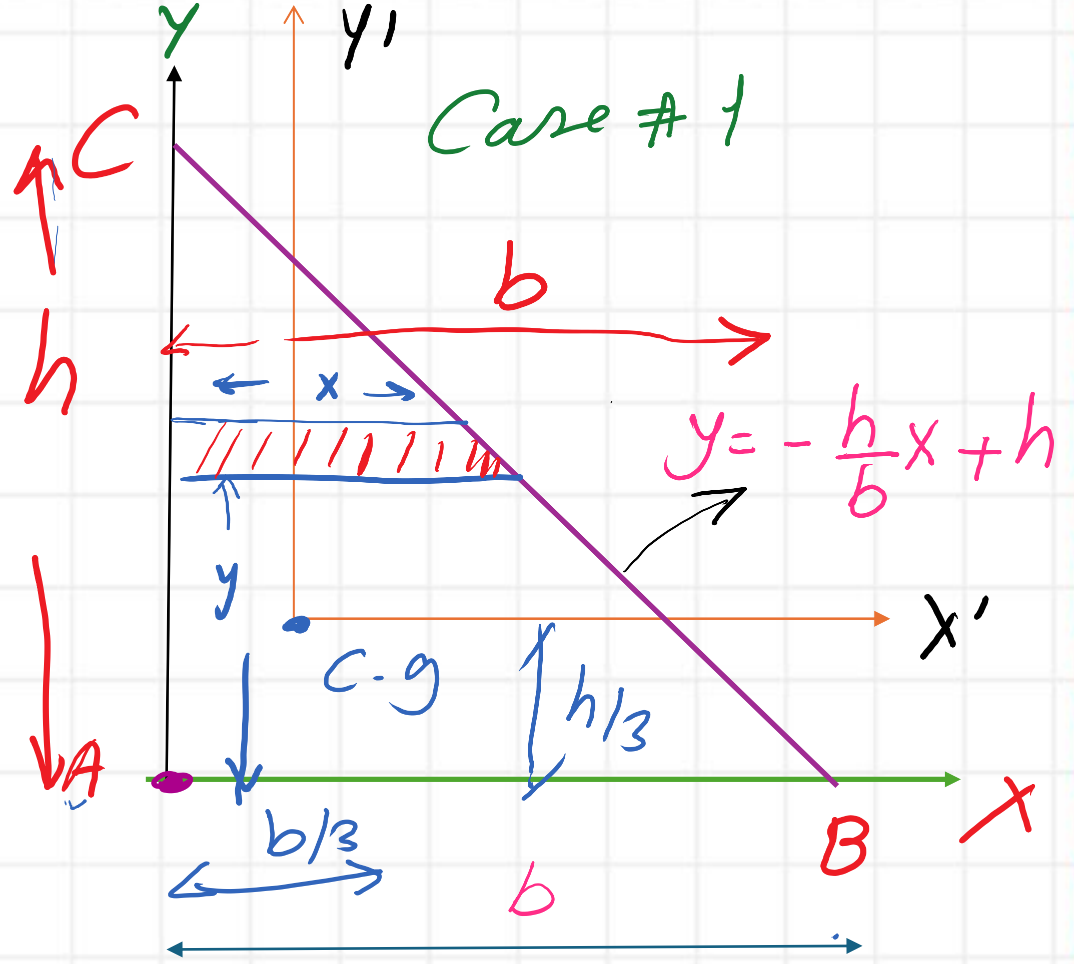


$$I_{xy} = \frac{1}{2h^2}\left[\frac{b^2h^4}{2} - \frac{2}{3}b^2h^4 + \frac{b^2}{4}h^4\right]$$

$$= \frac{1}{2h^2}\left[b^2h^4\right]\cdot\left[\frac{1}{2} - \frac{2}{3} + \frac{1}{4}\right]$$

$$I_{xy} = \frac{h^2b^2}{2}\cdot\left[\frac{6-8+3}{12}\right]$$

$$I_{xy} = \frac{h^2b^2}{2}\left[\frac{1}{12}\right] = \frac{b^2h^2}{24}$$



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I_{xy} For Right Triangle Contd

$$I_{xy} = \frac{h^2b^2}{2}\left[\frac{1}{12}\right] = \frac{b^2h^2}{24}$$

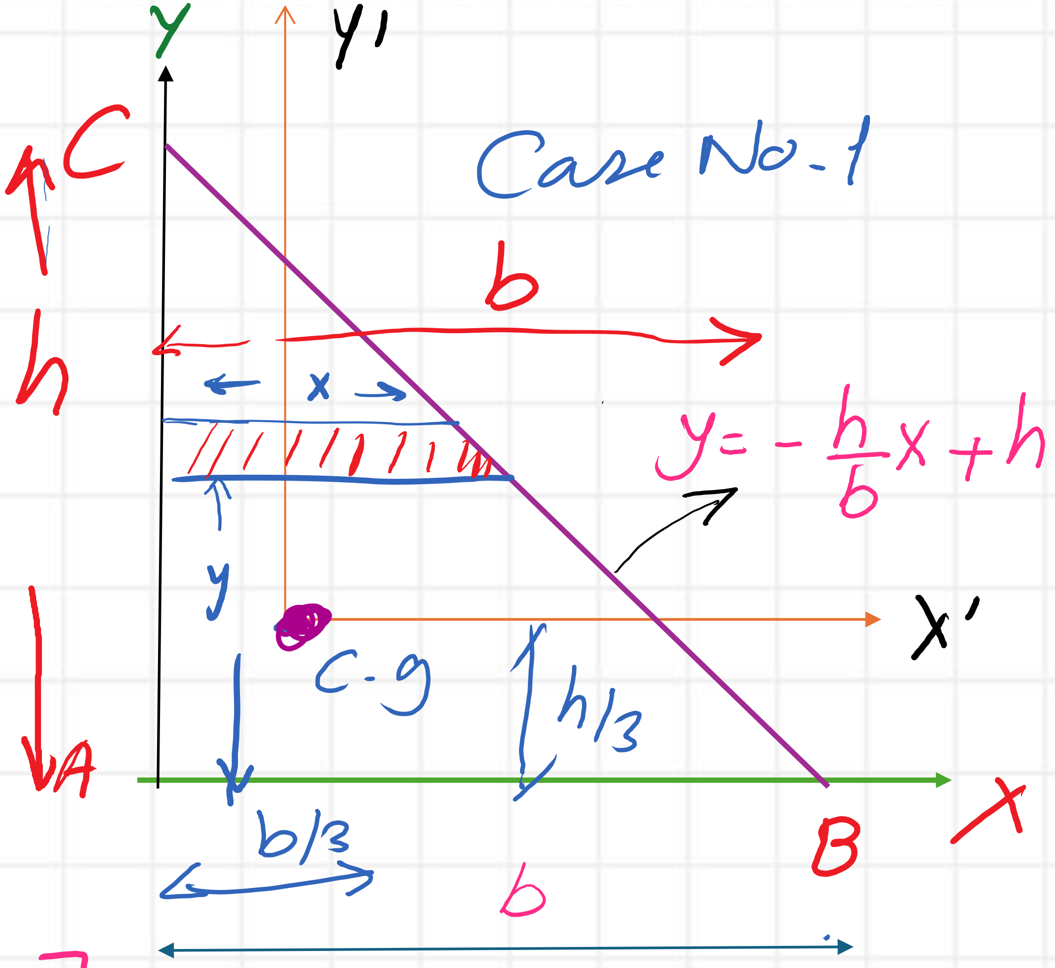
As For I_{xy} at C.g

we apply

$$I_{xy_g} = I_{xy} - A.\bar{x}.\bar{y}$$

$$I_{xy_g} = \left[\frac{b^2h^2}{24} - \frac{1}{2}b.h.\left(\frac{1}{3}b\right)\left(\frac{1}{3}h\right)\right]$$

$$= \frac{b^2h^2}{24}\left[1 - \frac{24}{18}\right] = \frac{b^2h^2}{24}\left[-\frac{1}{3}\right] = -b^2h^2/72$$



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