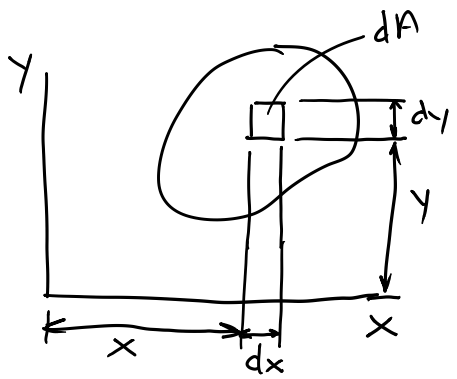
Centroid
- Center of Area

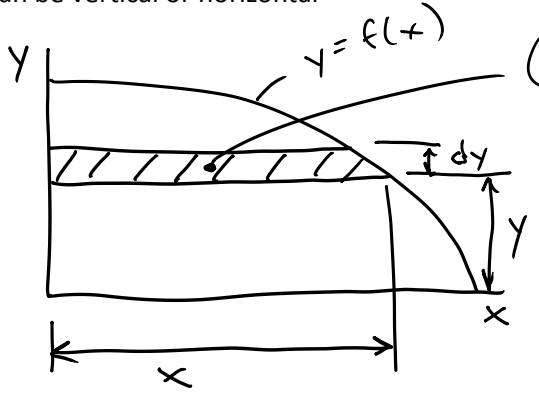
$$\bar{x} = \frac{\int x\,dA}{\int dA}$$

$$\bar{y} = \frac{\int y\,dA}{\int dA}$$



$dA = dx\,dy \Rightarrow$ Double Integral

Alternative to the double integral
- Select a differential strip
- Can be vertical or horizontal

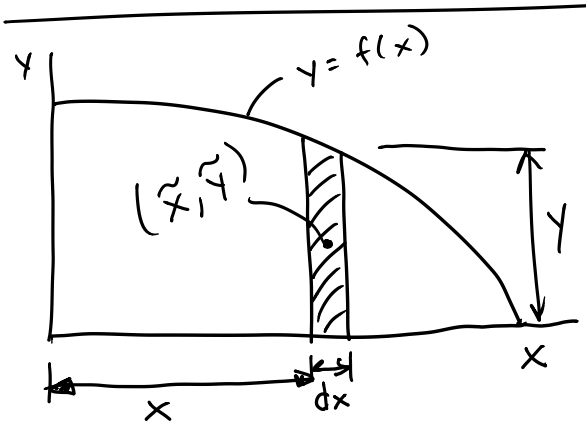


$(\tilde{x}, \tilde{y}) \Rightarrow$ Centroid of the differential strip

$$\bar{x} = \frac{\int \tilde{x}\,dA}{\int dA}, \quad \bar{y} = \frac{\int \tilde{y}\,dA}{\int dA}$$

$\tilde{x} = \frac{x}{2}$, $\tilde{y} = y$

$dA = x\,dy$



$$\bar{x} = \frac{\int \tilde{x}\,dA}{\int dA}, \quad \bar{y} = \frac{\int \tilde{y}\,dA}{\int dA}$$

$\tilde{x} = x$, $\tilde{y} = y/2$

$dA = y\,dx$

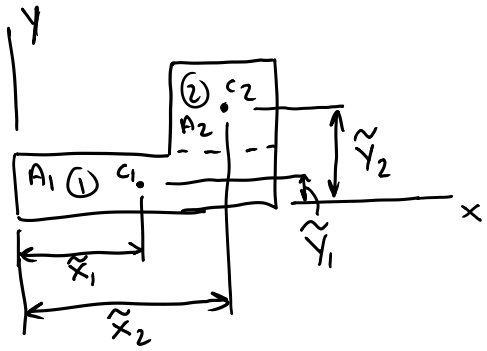
Use f(x) to solve for y in terms of x or y in terms of y

Centroid of Composite Bodies

- Used if the shape can be divided into simpler shapes of known area and centroid
- Avoid integration

$$\bar{x} = \frac{\sum \tilde{x}_i A_i}{\sum A_i} \qquad \bar{y} = \frac{\sum \tilde{y}_i A_i}{\sum A_i}$$

$\tilde{x}, \tilde{y}$ => Must be with respect to the same reference point for all shapes



$$\bar{x} = \frac{\tilde{x}_1 A_1 + \tilde{x}_2 A_2}{A_1 + A_2}$$

$$\bar{y} = \frac{\tilde{y}_1 A_1 + \tilde{y}_2 A_2}{A_1 + A_2}$$

Hole: Negative Area

Below the x-axis: negative $\tilde{y}$

Left of the y-axis: negative $\tilde{x}$