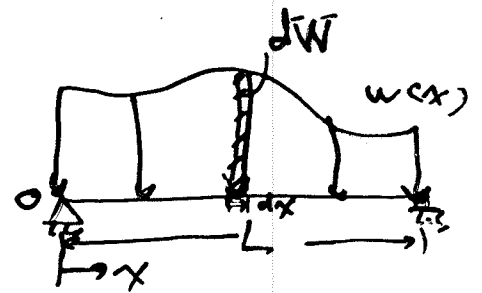


# Distributed Loads

To replace the distributed loads by a simple one, the two systems must be equivalent.

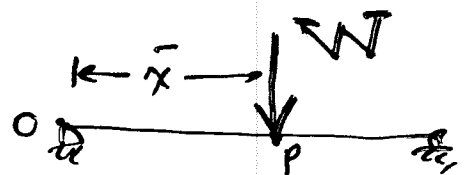


For the two systems to be equivalent, the two following conditions must be satisfied:

$\Sigma$  Forces must be the same in the two systems

$\Sigma$  Moments : : : " : : : "

① Forces :



$\Sigma F_y$  is equivalent  $\Rightarrow$

$$dW = dA = w dx$$

$$\int dW = \int_0^L w dx$$

$$= \int dA \Rightarrow$$

$$\boxed{W = A}$$

② Moments

$\Sigma M_0$  is equivalent  $\Rightarrow$

$$\bar{x} W = \int x dW$$

$$dW = w dx = dA$$

$$\Rightarrow \bar{x} = \frac{\int x dW}{W} \Rightarrow$$

$$\boxed{\bar{x} = \frac{\int x dA}{A}}$$

If the load is composed of "pieces" of linear functions then

$$\boxed{W = F_R = \sum_{i=1}^n A_i}$$

$$\boxed{\bar{x} = \frac{\sum_{i=1}^n \bar{x}_i A_i}{\sum_{i=1}^n A_i}}$$

