### 3.2.3 Double integrate over non rectangular regions

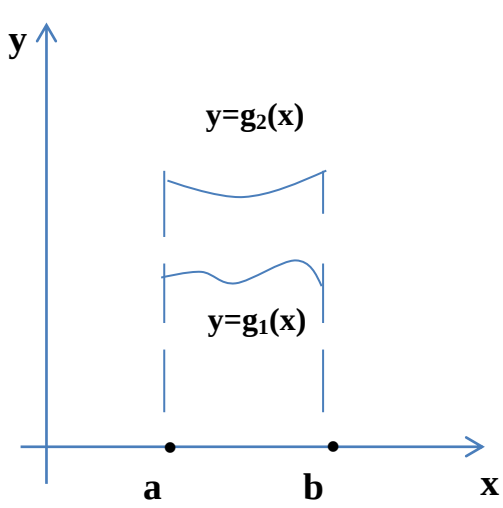
We will limit our study of double integral over non-rectangular regions to two basic types of regions , ( type I , and type II)

**Type I region** : it is bounded on the left and right by vertical lines x=a and x=b it is bounded below and above by continuous curves $y = g_1(x)$ and $y = g_2(x)$

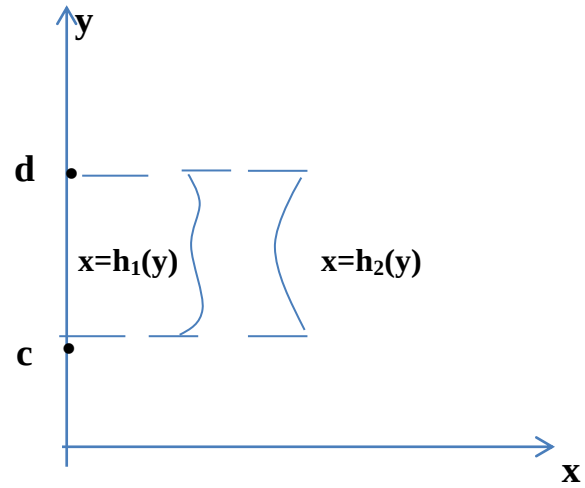
$$((g_1(x) \leq g_2(x) \text{ for } a \leq x \leq b))$$

**Type II region** : it is bounded below and above by horizontal lines y=c and y=d and it is bounded on the left and right by the curves $x = h_1(y)$ and $x = h_2(x)$

$$((h1(y) \leq h2(y) \text{ for } c \leq y \leq d))$$




**Type I**



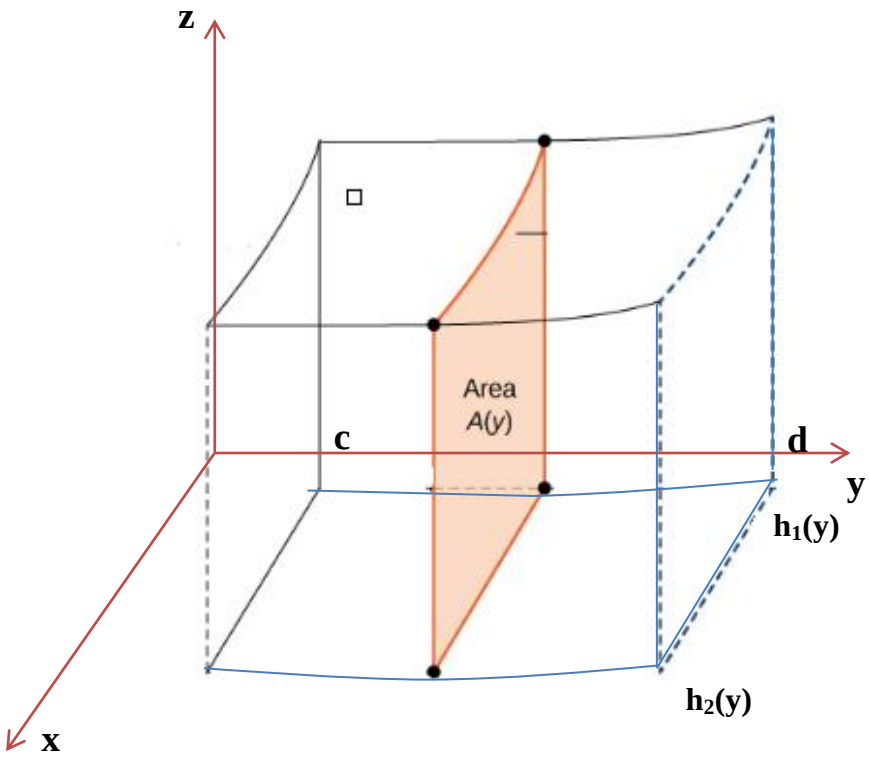

**Type II**

$$\iint_R f(x,y)dA = \int_a^b \int_{g_1(x)}^{g_{2(x)}} f(x,y)dydx \qquad \text{Type I}$$

$$\iint_R f(x,y)dA = \int_c^d \int_{h_1(y)}^{h_2(y)} f(x,y)dxdy \qquad \text{Type II}$$

$A(y) = \int_{h_{1(y)}}^{h_{2(y)}} f(x,y)dx$

$V = \int_c^d \int_{h_{1(y)}}^{h_{2(y)}} f(x,y)dxdy$




$A(x) = \int_{g_{1(x)}}^{g_{2(x)}} f(x,y)dy$

$V = \int_a^b \int_{g_{1(x)}}^{g_{2(x)}} f(x,y)dydx$