12.2 Notes

- When finding the double integral of a curve underneath a rectangle, we know

$$\iint_R f(x,y)\,dy\,dx = \lim_{\substack{n\to\infty \\ m\to\infty}} \sum_{i=1}^{n}\sum_{j=1}^{m} f(x_{ij}, y_{ij})\Delta A_{ij}$$

to find the area underneath a curve within a non-rectangular region D, define

$$F(x,y) = \begin{cases} f(x,y) & \text{if } (x,y) \in D \\ 0 & \text{if } (x,y) \in R \notin D \end{cases}$$

to find areas of non-rectangular regions, define limits of integration as functions of x or y

$$\iint_D f(x,y)\,dA = \int_a^b \int_{g_1(x)}^{g_2(x)} f(x,y)\,dy\,dx$$

$$D = \left\{ (x,y) \,\middle|\, \begin{matrix} a \le x \le b \\ g_1(x) \le y \le g_2(x) \end{matrix} \right\}$$

or

$$\iint_D f(x,y)\,dA = \int_c^d \int_{h_1(x)}^{h_2(x)} f(x,y)\,dx\,dy$$

$$D = \left\{ (x,y) \,\middle|\, \begin{matrix} c \le y \le d \\ h_1(y) \le x \le h_2(y) \end{matrix} \right\}$$