

The Double Integral-- Cross- Sectional Method

As an example we'll set up the animation to demonstrate the volume of $f(x, y) := \cos(x) \cdot \cos(y)$ on the unit square.

We start by graphing the surface:

$$a := 0 \quad b := 1 \quad c := 0 \quad d := 1 \quad \Delta x := .04 \quad \Delta y := .04 \quad i := 0.. \frac{b-a}{\Delta x} \quad j := 0.. \frac{d-c}{\Delta y}$$

$$x_i := a + i \cdot \Delta x \quad y_j := c + j \cdot \Delta y$$

$f(x, y) := \cos(x) \cdot \cos(y)$ $M_{i,j} := f(x_i, y_j)$ Under Plot 1 and the Appearance Tab change to a color map with weight 3.

Now we want to create the cross- sections. In this first example we'll consider the situation where

we fix y, i.e. $\int_0^1 \int_0^1 f(x, y) \, dx \, dy$.

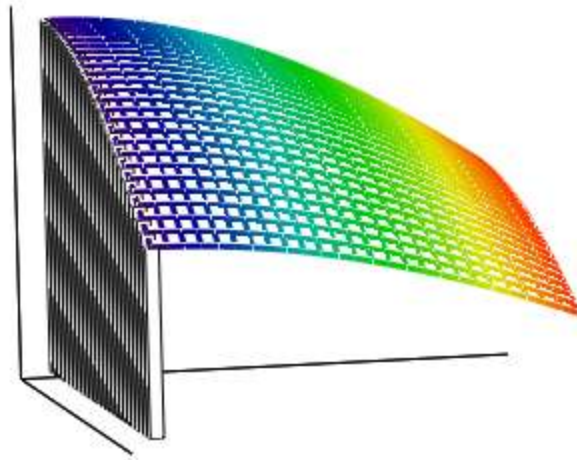
Now we define the cross sections

$$s := 0.. \frac{b-a}{\Delta x} \quad t := 0.. \frac{d-c}{\Delta y} \cdot \frac{\text{FRAME}}{25} \quad X_t := a + t \cdot \Delta x \quad Y_s := c + s \cdot \Delta y \quad N_{s,t} := f(X_t, Y_s)$$

Under the General Tab change Plot 2 from a surface plot to a bar plot. Under the Appearance tab use a solid color.

To Animate use 25 frames since $\Delta y = .04$ and we want y to go from 0 to 1.

Set the x and y axes to go from -1 to 26 and the z axis to go from 0 to 1.



M, N

To demonstrate $\int_0^1 \int_0^1 f(x, y) dy dx$ simply interchange the roles of s and t.

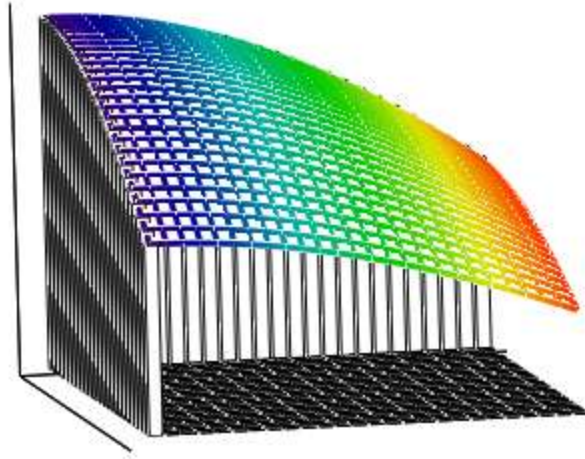
Use

$$s := 0.. \frac{b-a}{\Delta x} \cdot \frac{\text{FRAME}}{25} \quad t := 0.. \frac{d-c}{\Delta y} \quad X_t := a + t \cdot \Delta x \quad Y_s := c + s \cdot \Delta y \quad N_{s,t} := f(X_t, Y_s)$$

Under the General Tab change Plot 2 from a surface plot to a bar plot. Under the Appearance tab use a solid color.

To Animate use 25 frames since now $\Delta x = .04$ and we want y to go from 0 to 1.

Set the x and y axes to go from -1 to 26 and the z axis to go from 0 to 1.



M,N