

The Double Integral-- Demonstrating Riemann Sums

You may want to consider the cross-sectional format before beginning.

The only differences are

1. We will use a larger step size and not graph the surface
2. We have to animate in both the x and y directions

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.

$$f(x, y) := \cos(x) \cdot \cos(y)$$

$$a := 0 \quad b := 1 \quad c := 0 \quad d := 1 \quad \Delta x := .1 \quad \Delta y := .1$$

The next equation holds x fixed for the first 10 frames as y varies and then lets x vary for the next 10 frames

$$t := \begin{cases} \left(0 .. \frac{b-a}{\Delta x} \cdot \frac{\text{FRAME} - 10}{10} \right) & \text{if } 10 \leq \text{FRAME} \leq 20 \\ 1 & \text{otherwise} \end{cases}$$

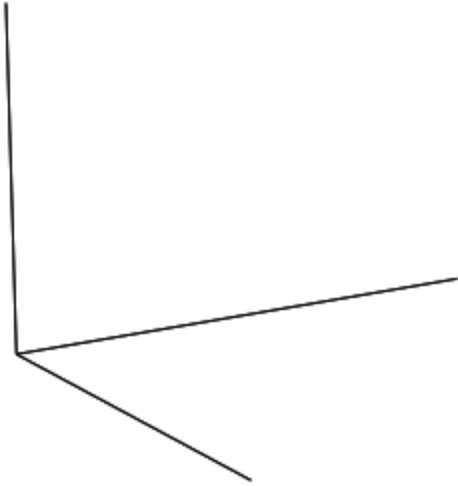
This equation allows y to vary over the first 10 frames and then remains fixed as x varies

$$s := \begin{cases} \left(0 .. \frac{d-c}{\Delta y} \cdot \frac{\text{FRAME}}{10} \right) & \text{if } \text{FRAME} \leq 10 \\ (0 .. 10) & \text{otherwise} \end{cases}$$

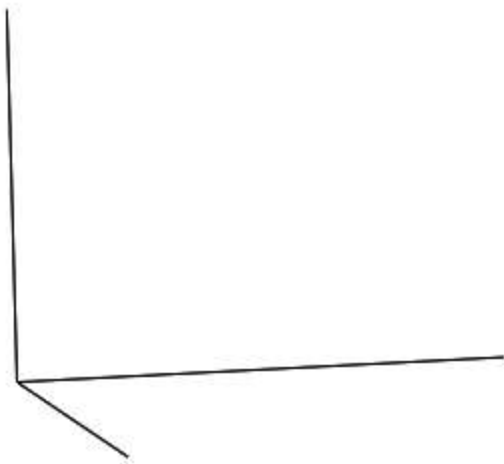
$$X_t := a + t \cdot \Delta x \quad Y_s := c + s \cdot \Delta y$$

$$N_{t,s} := f(X_t, Y_s)$$

Again to animate change surface plot to bar plot and use 20 frames



N



M, N