

Creating Animations to Demonstrate Triple Integrals

Here we are going to use as our example $f(x, y) := \cos(x) \cdot \cos(y)$ on the unit square $[0, 1] \times [0, 1]$.

We'll hold x and y fixed for the first 10 frames as z increases from 0 to the surface. Then we'll

keep x fixed as we allow y to vary from 0 to 1 for the next 10 frames creating a cross-section.

Finally we allow x to vary from 0 to 1 filling out the volume. The set up is basically the same as for graphs in rectangular coordinates.

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

To hold x fixed for the first 20 frames we define:

$$i := \begin{cases} 1 & \text{if } \text{FRAME} \leq 20 \\ (1 \dots \text{FRAME} - 20) & \text{otherwise} \end{cases} \quad x_i := i \cdot \Delta x$$

To hold y fixed for the first 10 frames we define

$$j := \begin{cases} 0 & \text{if } \text{FRAME} \leq 10 \\ 0 \dots \text{FRAME} - 10 & \text{if } 10 \leq \text{FRAME} \leq 20 \\ (0 \dots 10) & \text{if } \text{FRAME} > 20 \end{cases} \quad y_j := j \cdot \Delta y$$

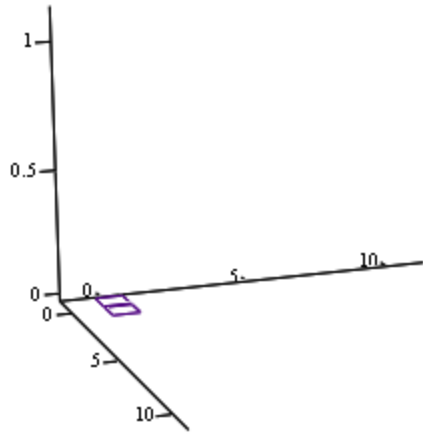
To allow z to vary from 0 to the surface we define:

$$f(x, y) := \cos(x) \cdot \cos(y) \quad M_{i,j} := \begin{cases} f(x_i, y_j) \cdot \frac{\text{FRAME}}{10} & \text{if } \text{FRAME} \leq 10 \\ f(x_i, y_j) & \text{otherwise} \end{cases}$$

To animate we use 30 frames. Under General change from a surface plot to a bar plot.

Set the x and y axes to go from -1 to 11 and the z axis to go from 0 to 1.

Not necessary but I use a color map.



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