

Changing the order of integration

1. Evaluate

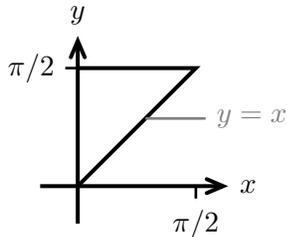
$$I = \int_0^{\pi/2} \int_x^{\pi/2} \frac{\sin y}{y} dy dx$$

by changing the order of integration.

Answer:

The given limits are (inner) y from x to $\pi/2$; (outer) x from 0 to $\pi/2$.

We use these to sketch the region of integration.



The given limits have inner variable y . To reverse the order of integration we use horizontal stripes. The limits in this order are

(inner) x from 0 to y ; (outer) y from 0 to $\pi/2$.

So the integral becomes

$$I = \int_0^{\pi/2} \int_0^y \frac{\sin y}{y} dx dy$$

We compute the inner, then the outer integrals.

$$\text{Inner: } \frac{\sin y}{y} x \Big|_0^y = \sin y. \quad \text{Outer: } -\cos y \Big|_0^{\pi/2} = 1.$$

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