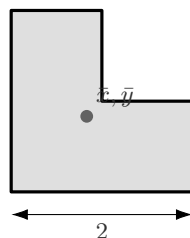
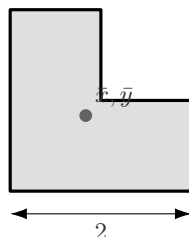


Question 5

A uniform square $0 \leq x, y \leq 2$ has the upper-right unit square removed. Find the centroid of the remaining L-shape.



Question 5 – Solution



Step 1: Treat the removed square as negative area. The full 2×2 square has

$$A_1 = 4, \quad (x_1, y_1) = (1, 1).$$

The removed 1×1 square has

$$A_2 = 1, \quad (x_2, y_2) = \left(\frac{3}{2}, \frac{3}{2}\right).$$

Step 2: Find the remaining area.

$$A = A_1 - A_2 = 4 - 1 = 3.$$

Step 3: Subtract the moments about the y -axis.

$$M_y = A_1x_1 - A_2x_2 = 4(1) - 1\left(\frac{3}{2}\right) = \frac{5}{2}.$$

Step 4: Subtract the moments about the x -axis.

$$M_x = A_1y_1 - A_2y_2 = 4(1) - 1\left(\frac{3}{2}\right) = \frac{5}{2}.$$

Step 5: Divide by the remaining area.

$$\bar{x} = \frac{M_y}{A} = \frac{5}{6}, \quad \bar{y} = \frac{M_x}{A} = \frac{5}{6}.$$

$$(\bar{x}, \bar{y}) = \left(\frac{5}{6}, \frac{5}{6}\right)$$