



Consider the geometry of a circular hole in a square. By inspection determine the location where the center of mass of the object is located.

Locate the coordinate system at the center of the square.

- A)  $(x_c, y_c) = \left( \frac{(4r)^2(0) + (\pi r^2)(-r)}{(4r)^2 + \pi r^2}, \frac{(4r)^2(0) + (\pi r^2)(-r)}{(4r)^2 + \pi r^2} \right)$ .
- B)  $(x_c, y_c) = \left( \frac{(4r)^2(0) + (-\pi r^2)(-r)}{(4r)^2 + \pi r^2}, \frac{(4r)^2(0) + (-\pi r^2)(-r)}{(4r)^2 + \pi r^2} \right)$ .
- C)  $(x_c, y_c) = \left( \frac{(4r)^2(0) + (\pi r^2)(-r)}{(4r)^2 - \pi r^2}, \frac{(4r)^2(0) + (\pi r^2)(-r)}{(4r)^2 - \pi r^2} \right)$ .
- D)  $(x_c, y_c) = \left( \frac{(4r)^2(0) + (-\pi r^2)(-r)}{(4r)^2 - \pi r^2}, \frac{(4r)^2(0) + (-\pi r^2)(-r)}{(4r)^2 - \pi r^2} \right)$ .

Think of the hole as having negative mass, therefore

$$x_c = \frac{(4r)^2(0) + (-\pi r^2)(-r)}{(4r)^2 - \pi r^2} = \frac{(4r)^2(0) + (\pi r^2)(r)}{(4r)^2 - \pi r^2}.$$

The same is true for  $y_c$ .

Answer **D**.