Homework Section 15.5

1. Calculate the mass and the center of mass of the lamina that occupies the region *R* and has density function $\rho(x, y)$.

   a) $R = \{(x, y) \mid -1 \le x \le 1,\ 0 \le y \le 2\};\ \rho(x, y) = x^2 y$

   b) *R* is bounded by the parabola $x = y^2$ and the line $y = -x + 2;\ \rho(x, y) = 4$

2. A lamina is given by the quarter disk $x^2 + y^2 \le 4$ in the first quadrant. Calculate its center of mass when the density at any point on the lamina is proportional to its distance from the origin. [Hint: using polar coordinates, the distance to the origin is *r*.]

3. Find the moments of inertia I_x, I_y, I_0 for the lamina in exercise 2.

4. Suppose a lamina corresponds to the region between the curve $y = \cos x$ and the *x*-axis from $x = 0$ to $x = \pi/2$. Given that the lamina has constant density $\rho(x, y) = \rho$, Calculate the moments of inertia I_x and I_y and the radii of gyration $\bar{\bar{x}}$ and $\bar{\bar{y}}$.