Mechanics Based Problems

1. Find the mass and center of mass of the lamina that occupies the region D and has the given density function ρ.

$$D = \{(x, y) | 0 \leq x \leq 2, -1 \leq y \leq 1\}; \rho(x, y) = xy^2$$

$$(\bar{x}, \bar{y}) = \left(\frac{4}{3}, 0\right)$$

2. Find the mass and center of mass of the lamina that occupies the region D and has the given density function ρ where D is bounded by $y = e^x$, $y = 0$, $x = 0$, and $x = 1$; $\rho(x, y) = y$

$$(\bar{x}, \bar{y}) = (0.656, 1.32751)$$

Problem Solving Problems

1. A lamina occupies the part of the disk $x^2 + y^2 \leq 1$ in the first quadrant. Find its center of mass if the density at any point is proportional to its distance from the x-axis.

$(\bar{x}, \bar{y}) = (0.59, 0.38)$

2. A lamina occupies the part of the disk $x^2 + y^2 \leq 1$ in the first quadrant. Find its center of mass if the density at any point is proportional to the square of its distance from the origin.

$(\bar{x}, \bar{y}) = (.509, .509)$