Problem 1. a) (5 points) Find the length of the curve given by \( x = \int_{0}^{\frac{y}{4}} \sqrt{\sec^4 t - 1} \, dt, \quad -\frac{\pi}{4} \leq y \leq \frac{\pi}{4}; \)

b) (5 points) Find the area of the surface generated by revolving the curve \( x = 2\sqrt{4 - y}, \quad 0 \leq y \leq \frac{15}{4} \) about the \( y \)-axis.

Problem 2. (10 points) Find the center of mass of a thin plate of constant density \( \delta = 2 \) covering the region in the \( xy \)-plane enclosed by the parabolas \( y = x^2 - 3 \) and \( y = -2x^2 \).