2)(30 points) Use the method of Lagrange multipliers to find all extremes of \( f(x, y) = x^2 + y^2 - x^2y \), along the curve \( x^2 + y^2 = 1 \).

3)(40 points) Let \( R \) be the region bounded by the curves \( x = y \) and \( x = y^2 \). Write the integrals for \( \int \int_R f dA \) in two different ways
a) As a type one region.
b) As a type two region.

Final B Sixty Minutes Show All Work

1)(50 points) Let \( R \) be defined as
\[
R = \{(x, y)| \frac{x^2}{4} + \frac{y^2}{9} \leq 1; x \leq 0\}
\]
a)(5 points) Sketch \( R \)
b)(20 points) Write \( R \) as a type I region, for example, \( R = \{(x, y)| \cdots \} \).
c)(10 points) If you change to elliptical co-ordinates: \( x = 2r \cos \theta, y = 3r \sin \theta \), compute the Jacobean matrix \( J(r, \theta) \).
d)(15 points) Use the change of variable in c) to compute the value of \( \int \int_R 1 \ dA \)