HOMEWORK 5

NAME:____________________

Problem 1: Let R be the region in the first quadrant of the xy-plane bounded by the hyperbolas $xy = 1, xy = 9$ and the lines $y = x, y = 4x$. Use the transformation $x = u/v, y = uv$ with $u > 0$ and $y > 0$ to rewrite

$$\iint_R \left(\sqrt{\frac{y}{x}} + \sqrt{xy}\right) dxdy$$

as an integral over an appropriate region G in the uv-plane. Then evaluate the uv-integral over G.

Date: February 19, 2025.

Problem 2: Use the transformation $u = x - y/2$ and $v = y$ to evaluate the integral

$$\int_0^{1/2} \int_{y/2}^{(y+4)/2} y^3 (2x - y) e^{(2x-y)^2} \, dx dy.$$

Problem 3: Find the mass of an object bounded by

$$1 \leq x \leq 2, 0 \leq xy \leq 1, 0 \leq z \leq 2$$

with a density function $x^2y + 2xyz$ by using the transformation $u = x, v = xy, w = 3z$.

Problem 4: Convert

$$\int_0^{2\pi}\int_0^{\sqrt{2}}\int_r^{\sqrt{4-r^2}} 3r dz dr d\theta \ (r \geq 0)$$

to spherical coordinates and then evaluate the integral.

Problem 5: Use the transformation $x = u^2 - v^2, y = 2uv$ to evaluate the integral

$$\int_0^1 \int_0^{2\sqrt{1-x}} \sqrt{x^2 + y^2} dydx.$$