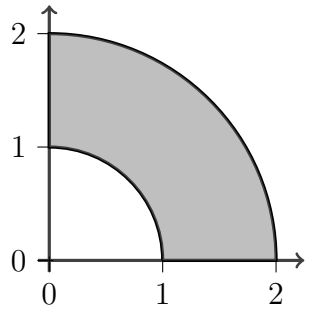
Name: _____ Sort #: _____

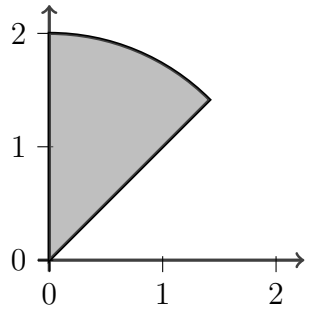
# Worksheet 15

**Change of Variables & Polar Coordinates** MATH 2210, Fall 2018

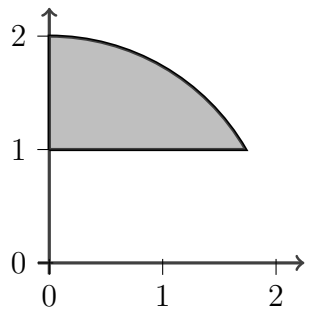
1. (a) Give the limits of integration for this region in polar coordinates.




(b) Give the limits of integration for this region in both Cartesian and polar coordinates. The arc is part of the circle $x^2 + y^2 = 4$.




(c) Give the limits of integration for this region in both Cartesian and polar coordinates. The arc is part of the circle $x^2 + y^2 = 4$.



2. Compute the Jacobian $J(u, v)$ for the the transformation

$$T : x = u\cos(\pi v) \quad \text{and} \quad y = u\sin(\pi v).$$

3. Find the volume of the solid bounded by the paraboloids $z = x^2 + y^2$ and $z = 2 - x^2 - y^2$.

4. A region $R$ in the $xy$-plane is shown here. Use the substitutions

$$x = 2u + v \text{ and } \ y = u - v$$

to express the double integral

$$\iint_R (x + y)\, dA$$

in terms of $u$ and $v$ and evaluate it.