MA 213 Worksheet #19

Section 15.9
3/28/19

1 Find the Jacobian of the transformations.

(a) *15.9.1* $x = 2u + v, \quad y = 4u - v$

(b) *15.9.3* $x = s\,\cos t, \quad y = s\,\sin t$

2 *15.9.9* Let S be the triangular region with vertices $(0,0), (1,1), (0,1)$. Find the image of S under the the transformation

$$x = u^2, \quad y = v.$$

3 *15.9.11* A region R in the xy-plane is bounded by

$$y = 2x - 1,\ y = 2x + 1,\ y = 1 - x,\ y = 3 - x$$

Find equations for a transformation T that maps a rectangular region S in the uv-plane onto R, where the sides of S are parallel to the $u-$ and $v-$ axes.

4 Use the given transformation to evaluate the integral.

(a) *15.9.15* $\iint_R (x - 3y)\,dA$, where R is the triangular region with vertices $(0,0), (2,1)$, and $(1,2)$; $\quad x = 2u + v,\ y = u + 2v.$

(b) *15.9.17* $\iint_R x^2\,dA$, where R is the region bounded by the ellipse

$$9x^2 + 4y^2 = 36; \quad x = 2u, y = 3v$$

5 Evaluate the integral by making an appropriate change of variables.

(a) *15.9.23* $\iint_R \dfrac{x - 2y}{3x - y} dA$, where R is the parallelogram enclosed by the lines

$$x - 2y = 0,\ x - 2y = 4,\ wx - y = 1,\ \text{and } 3x - y = 8.$$

(b) *15.9.25* $\iint_R \cos\left(\dfrac{y - x}{y + x}\right) dA$, where R is the trapezoidal region with vertices

$$(1,0),\ (2,0),\ (0,2),\ \text{and}(0,1).$$