Section 4-8 : Change of Variables

For problems 1 – 3 compute the Jacobian of each transformation.

1. $x = 4u - 3v^2 \qquad y = u^2 - 6v$

2. $x = u^2 v^3 \qquad y = 4 - 2\sqrt{u}$

3. $x = \dfrac{v}{u} \qquad y = u^2 - 4v^2$

4. If *R* is the region inside $\dfrac{x^2}{4} + \dfrac{y^2}{36} = 1$ determine the region we would get applying the transformation $x = 2u$, $y = 6v$ to *R*.

5. If *R* is the parallelogram with vertices $(1,0)$, $(4,3)$, $(1,6)$ and $(-2,3)$ determine the region we would get applying the transformation $x = \dfrac{1}{2}(v-u)$, $y = \dfrac{1}{2}(v+u)$ to *R*.

6. If *R* is the region bounded by $xy = 1$, $xy = 3$, $y = 2$ and $y = 6$ determine the region we would get applying the transformation $x = \dfrac{v}{6u}$, $y = 2u$ to *R*.

7. Evaluate $\displaystyle\iint\limits_R xy^3 \, dA$ where *R* is the region bounded by $xy = 1$, $xy = 3$, $y = 2$ and $y = 6$ using the transformation $x = \dfrac{v}{6u}$, $y = 2u$.

8. Evaluate $\displaystyle\iint\limits_R 6x - 3y \, dA$ where *R* is the parallelogram with vertices $(2,0)$, $(5,3)$, $(6,7)$ and $(3,4)$ using the transformation $x = \dfrac{1}{3}(v-u)$, $y = \dfrac{1}{3}(4v-u)$ to *R*.

9. Evaluate $\displaystyle\iint\limits_R x + 2y \, dA$ where *R* is the triangle with vertices $(0,3)$, $(4,1)$ and $(2,6)$ using the transformation $x = \dfrac{1}{2}(u-v)$, $y = \dfrac{1}{4}(3u + v + 12)$ to *R*.