Math 2401 (K1-K3)
3/2/2015

Worksheet 10
Substitution in Double Integrals

1. Use substitution to find:

$$\iint_R e^{4x-y}\,dA,$$

where R is the parallelogram with vertices $(0,0)$, $(3,3)$, $(7,4)$, and $(4,1)$.
Hint: Try the substitution $u = x - y$; $v = x - 4y$.
Hint: There are often more than one "good" substitutions in these cases; for instance, try also the substitution $u = 4x - y$ and $v = x - y$.

2. Use substitution to find:

$$\iint_R (x^2 + y^2)\,dA,$$

where R is the domain bounded by $1 \le xy \le 4$ and $1 \le \frac{y}{x} \le 4$.
Hint: Try $u = xy$ and $v = \frac{y}{x}$.

3. Use substitution to find:

$$\iint_R (x+y)^2 \sin^2(x-y)\,dA,$$

where R is the square with vertices $(0,1)$, $(1,2)$, $(2,1)$, and $(1,0)$.
Hint: Try a substitution dictated by making the integral easier to compute.

4. Compute the integral:

$$\int_1^2 \int_{x+2}^{x+3} \frac{dy\,dx}{\sqrt{xy - x^2}}$$

by using the substitution $u = x$; $v = y - x$. Try to also compute the integral as it was given.

5. (a). Compute the integral:

$$\int_0^4 \sqrt{x}\cos(\sqrt{x})\,dx$$

by using the substitution $u = \sqrt{x}$.
(b). Verify that

$$\int_0^4 \sqrt{x}\cos(\sqrt{x})\,dx = \int_0^4 \int_0^1 \sqrt{x}\cos(\sqrt{x})\,dy\,dx$$

and that you get the same result as in part (a). by working with this double integral and using the substitution $u = \sqrt{x}$, $v = y$.