MA 362
Spring 2017

Homework 8

Due March 23rd in class or by 3:20 pm in MATH 602.

1. Evaluate
$$\iint_D \sin(x^2+y^2)dxdy,$$
where D is the region given by $1 \le x^2+y^2 \le 2$, $x \ge 0$, and $y \le 0$.

2. Evaluate
$$\iint_D e^{y-x}dxdy,$$
where D is the region inside the parallelogram with vertices $(1,1)$, $(2,3)$, $(5,4)$, and $(4,2)$.

   Hint: It may be helpful to use a change of variables which converts the parallelogram into a square.

3. Evaluate
$$\iint_D (x^2+xy+y^2)dxdy,$$
where D is the region inside the ellipse given by $x^2+xy+y^2=3$.

   Hint: It may be helpful to use a change of variables of the form $x = au+bv$ and $y = au-bv$ with constants a and b chosen so as to convert the ellipse to a circle.

4. Let $\alpha = (x^2+y^2)dx + (x^2-y^2)dy$. Evaluate and simplify as much as possible the following: $d\alpha$, $*\alpha$, $\alpha \wedge *\alpha$.

5. Let $f = f(x,y)$ be twice differentiable. Write out ddf, $d*df$ and $df \wedge *df$ in terms of the partial derivatives of f, and simplify as much as possible.

6. Let D be the region inside the triangle with vertices $(2,2)$, $(-2,2)$, and $(0,10)$. Find the flux of the vector field
$$(e^{\cos(x^2)}+e^{\cos(y^2)}, x^2+y^2)$$
outward through the boundary of D.