

**Math 2013 Assignment 3**  
**Due Friday Jan. 29 in class**

1. Evaluate the following line integrals

(a)

$$\int_C (x - 3y^2 + z) ds$$

where  $C$  is the line segment from the origin to  $(1, 1, 1)$ .

(b)

$$\int_C (xy + y + z) ds$$

where  $C$  is the curve parametrized by  $\vec{r}(t) = 2t\vec{i} + t\vec{j} + (2 - 2t)\vec{k}$ , from  $(0, 0, 2)$  to  $(2, 1, 0)$ , (you need to work out the  $t$  limits from the points).

(c)

$$\int_C (x^2 - y) ds$$

where  $C$  is the part of the circle  $x^2 + y^2 = 4$  in the first quadrant from  $(0, 2)$  to  $(2, 0)$ .

2. Find the work done the the field  $\vec{F} = (y - x^2)\vec{i} + (z - y^2)\vec{j} + (x - z^2)\vec{k}$  along the curve  $\vec{r} = t\vec{i} + t^2\vec{j} + t^3\vec{k}$  from  $(0, 0, 0)$  to  $(1, 1, 1)$ .
3. Evaluate  $\int_C xy dx + (x + y) dy$  along the curve  $y = x^2$  from  $(-1, 1)$  to  $(2, 4)$ .
4. Find the work done by the gradient of  $f(x, y) = (x + y)^2$  counterclockwise around the circle  $x^2 + y^2 = 4$  from  $(2, 0)$  to itself.