

## Homework 10

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**Problem 1.** Compute the work done by the force field

$$\vec{F} = (6xy - y^3)\vec{i} + (3y^2 + 3x^2 - 3xy^2)\vec{j}$$

along the path  $\vec{r}(t) = \langle \cos(t), \sin(t) \rangle$  for  $-\pi/2 \leq t \leq \pi/2$ .

**Problem 2.** Evaluate

$$\int_C xy^3 dx + 3x^2 y^2 dy$$

where  $C$  is the boundary of the region in the first quadrant enclosed by the  $x$ -axis, the line  $x = 1$  and the curve  $y = x^3$ , traveled counter-clockwise.

**Problem 3.** Evaluate

$$\int_C x^2 dx + y^2 dy + z^2 dz$$

where  $C$  is the straight line segment from  $(1, 2, 3)$  to  $(2, 3, 4)$ .

**Problem 4.** Evaluate

$$\int_C (6y + x)dx + (y + 2x)dy$$

where  $C$  is the circle

$$(x - 2)^2 + (y - 3)^2 = 4$$

oriented counterclockwise.

**Problem 5.** A particle moves along the line segments from  $(0, 0, 0)$  to  $(1, 0, 0)$  to  $(1, 5, 1)$  to  $(0, 5, 1)$  and back to  $(0, 0, 0)$  under the influence of the vector field

$$\vec{F}(x, y, z) = z^2\vec{i} + 3xy\vec{j} + 4y^2\vec{k}.$$

Find the work done.