

Math 13. Multivariable Calculus. Written Homework 5.

Due on Monday, 4/30/12.

You may leave this homework in the boxes outside of Kemeny 108 by 12:30 pm on Monday. Please write problems 1-2 on separate pages from problems 3-5 and turn them in in the corresponding columns.

1. (Ch 16.2, #16) Evaluate the line integral

$$\int_C (y+z)dx + (x+z)dy + (x+y)dz,$$

where C is the concatenation of the line segment from $(0, 0, 0)$ to $(1, 0, 1)$ with the line segment from $(1, 0, 1)$ to $(0, 1, 2)$.

2. (Ch 16.2, #34) A thin wire has the shape of the first-quadrant part of the circle with center the origin and radius a . If the density function is $\rho(x, y) = kxy$, find the mass and center of mass of the wire.
3. (Ch 16.1, #26) Find the gradient vector field ∇f of $f(x, y) = \sqrt{x^2 + y^2}$ and sketch it.
4. (Ch 16.2, #32(a)) Find the work done by the force field $\mathbf{F}(x, y) = x^2\mathbf{i} + xy\mathbf{j}$ on a particle that moves once around the circle $x^2 + y^2 = 4$ oriented in the counterclockwise direction.
5. (Ch 16.2, #42) The force exerted by a unit electric charge at the origin on a charged particle at a point (x, y, z) is $\mathbf{F}(\mathbf{r}) = \mathbf{r}/|\mathbf{r}|^3$, where $\mathbf{r} = \langle x, y, z \rangle$. Find the work done as the particle moves along a straight line from $(2, 0, 0)$ to $(2, 1, 5)$.