

Math 11. Multivariable Calculus.
Written Homework 5.

Due on Wednesday, 10/22/14.

You can turn in this homework by leaving it in the boxes labeled Math 11 in the hallway outside of 008 Kemeny anytime before 3:00 pm on Wednesday.

1. Find the gradient vector field ∇f of $f(x, y) = \sqrt{x^2 + y^2}$ and sketch it.
2. 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.
3. 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.
4. Find a potential function $f(x, y)$ for $\mathbf{F} = \langle (1 + xy)e^{xy}, x^2e^{xy} \rangle$, and evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$, where C is given by $\mathbf{r}(t) = \langle \cos t, 2 \sin t \rangle$, $0 \leq t \leq \pi/2$.