Math 324 Quiz 4 Practice

February 23, 2017

Problem 1. Write the definition of a vector field $\vec{F}(x, y)$ being conservative.

Problem 2. Give an example of a conservative vector field.

Problem 3. Give an example of a non-conservative vector field.

Problem 4. Consider the curve C parametrized by

$$\vec{r}(t) = \langle t\cos(t), t\sin(t)\rangle$$

as $0 \leq t \leq 10\pi$. Calculate the integral $\int_C \vec{F} \cdot d\vec{s}$ for the vector field

$$\vec{F}(x, y) = \langle x + 2xy, y + x^2\rangle.$$

Problem 5. Let C be the closed curve formed by a circle of radius 1 centered at the origin. Calculate the integral

$$\oint_C \vec{F}(x, y) \cdot d\vec{s}$$

where here $\vec{F}(x, y)$ is the vector field

$$\vec{F}(x, y) = \langle y^3, -x^3\rangle.$$

[Hint: Green's theorem makes the work easier]