Name: SOLUTIONS

Quiz #9 - November 18, 2008

1. Show that vector field $\vec{F}(x,y) = (2xy, x^2)$ is conservative by finding a potential function.

$$f = x^2 y \qquad \nabla f = \langle 2xy, x^2 \rangle$$

2. Find the work done by $\vec{F}$ from problem 1 in moving a particle along a curve from $(2,2)$ to $(4,3)$.

$$4^2 \cdot 3 - 2^2 \cdot 2 = 40$$

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2. Find the work done by $\vec{F}$ from problem 1 in moving a particle along a curve from $(2,2)$ to $(4,3)$.

Name: SOLUTIONS

Quiz #9 - November 20, 2008

1. Find the work done by the force field $\vec{F}(x,y) = (2y^{3/2}, 3x\sqrt{y})$ in moving an object from (2,4) to (5,9).

Notice that $\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} = 3\sqrt{y} - 3\sqrt{y} = 0$ so $\vec{F}$ is conservative, $\vec{F} = \nabla f$.

$f = \int 2y^{3/2}\,dx = 2xy^{3/2} + g(y)$ $\quad f = \int 3x\sqrt{y}\,dy = 2xy^{3/2} + h(x)$

Thus $f = 2xy^{3/2}$. The fund. thm of line integrals says

$$\int_C \nabla f \cdot d\vec{r} = f(5,9) - f(2,4) = 2 \cdot 5 \cdot 27 - 2 \cdot 2 \cdot 8$$
$$= 270 - 32 = 238$$

2. Sketch a region of $\mathbb{R}^2$ which is open and connected but not simply connected.