

Quiz #12; Wed, 4/20/2016

Math 53 with Prof. Stankova

Section 107/110; MWF10-11

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Student Name: _____

Do **ONE** of the two problems below of your choosing.

Problem 1. Find the volume of the part of the ball $\rho \leq a$ that lies between the cones $\phi = \pi/6$ and $\phi = \pi/3$.

Problem 2. Let $\mathbf{F} = \left\langle \frac{-y}{x^2 + y^2}, \frac{x}{x^2 + y^2} \right\rangle$ be a vector field on $\mathbb{R}^2 \setminus \{(0, 0)\}$ and C be a path traversing a circle of radius R centered at the origin in a counterclockwise orientation. Compute the integral:

$$\int_C \mathbf{F} \cdot d\mathbf{r}$$

Solution 1.

$$\int_0^a \int_0^{2\pi} \int_{\pi/6}^{\pi/3} \rho^2 \sin \phi \, d\phi d\theta d\rho$$

Solution 2.

$$\int_0^{2\pi} (-\sin t)(-\sin t) + (\cos t)(\cos t) dt = 2\pi$$

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