

MAT235 Tutorial 14

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This week: final exam prep and review problems (taken up in tutorial).

Problems:

1. Find the parametrization of the positively-oriented simple closed curve L such that the line integral $\oint_L 2y^3 dx - (3x^3 - 5x) dy$ is a maximum.
2. Let T be a torus with radius $r_1 = 8$ and $r_2 = 3$. The parametrization of such a torus is given by

$$\mathbf{r}(\theta, \varphi) = \langle (8 + 3 \cos \varphi) \cos \theta, (8 + 3 \cos \varphi) \sin \theta, 3 \sin \varphi \rangle$$

for $\theta, \varphi \in [0, 2\pi]$. Let $\mathbf{F}(x, y, z) = \langle x, -y, 3z \rangle$. Show that the divergence theorem holds:

$$\iint_{\partial T} \mathbf{F} \cdot d\mathbf{S} = \iiint_V (\nabla \cdot \mathbf{F}) dV.$$