

Worksheet #27: Green-Eyed Monster

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Problem 1. Suppose that a cable has constant linear density k and has the shape of the helix

$$x = 4 \cos t, y = 4 \sin t, z = 3t, 0 \leq t \leq \pi/2.$$

Find its center of mass.

I will discuss Green's Theorem in anticipation of tomorrow's lecture, and the midterm.

Problem 2. Use Green's Theorem to give an alternative proof that the line integral of a conservative vector field around a loop is 0.

Problem 3. Let γ be the path that travels clockwise around the perimeter of the trapezoid with vertices $(-1, -1)$, $(1, -1)$, $(1, 2)$, $(-1, 4)$. Evaluate the line integral

$$\oint_{\gamma} \langle x^3 - yx, 6y - 9x \rangle d\vec{r}$$

(Numerical answer $2 \cdot 3^{-1} \cdot 109$.)