

Math 233 - November 12, 2009

- If $F = (p, q)$ then $\text{Rot } F = q_x - p_y$
- Green's Theorem

$$\oint_{\partial R} F = \iint_R \text{Rot } F \, dA$$

- Green's Theorem on regions with holes
- Other line integrals
- Other ways to write Green's Theorem

1. Let $F(x, y) = (x, xy^2)$. Find the rotation of F .

$$\text{Rot } F =$$

2. Let $F(x, y) = (x^3y, x/y)$. Find the rotation of F .

$$\text{Rot } F =$$

3. Let

$$R = \{(x, y) | 1 \leq x^2 + y^2 \leq 2\}$$

- (a) Graph the region R .
- (b) What is the boundary of R ?
- (c) Does it make sense to compute a curve integral along the boundary of R , ∂R ?
- (d) What would "oriented positively" mean for the boundary of R ?
- (e) Will Green's Theorem work on the region R ? If so, how?

Lecture Problems

4. Let $r(t) = (t, t^3)$. At time t , find a vector that is tangent to the curve at $r(t)$? Can you find a unit tangent vector?

Tangent Vector:

Unit Tangent Vector:

5. Let $C(t) = (3t, t^3)$, $0 \leq t \leq 1$. Find

$$\int_C x^3 + y \, ds =$$

6. Let C be the line segment from $(0, 0)$ to $(\pi, 2\pi)$. Find

$$\int_C \sin x + \cos y \, ds =$$