Green's Theorem

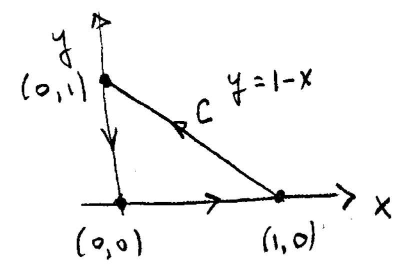
Group Members:

1. ____________________
2. ____________________
3. ____________________
4. ____________________

Work together as a team to solve the following problems.

1. Evaluate the following line integral by using Green's Theorem (Hint: integrate over the inside of the region).

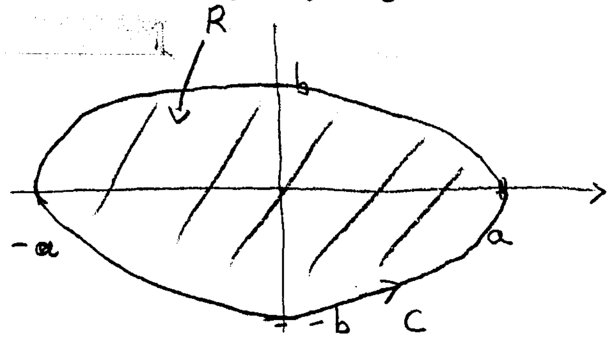
$$\int_C x^4\,dx + xy\,dy = \int_C P\,dx + Q\,dy = \int_C \vec{F}\cdot d\vec{r} = \int_C \vec{F}\cdot r'(t)\,dt$$



a) What do $P(x,y)$, $Q(x,y)$, $\vec{F}(x,y)$ equal?

b) $= \iint_R (\text{curl}\,\vec{F})_s\,dA = \iint_R \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right) dA$. Set up and evaluate.

2. Evaluate the following integral over a region by using Green's theorm to evaluate it on the boundary of the region.



$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

$$\iint_R 1 \, dA = \frac{1}{2} \oint_C x\,dy - y\,dx = \oint_C \vec{F} \cdot d\vec{r}$$

a) Show by Green's Thm That $\oint_C (-y, x) \cdot d\vec{r} = \iint_R 1 \, dA = \text{Area}(R)$

$P(x,y) =$ $\qquad \frac{\partial P}{\partial y} =$ $\qquad \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right)$

$Q(x,y) =$ $\qquad \frac{\partial Q}{\partial x} =$ $\qquad =$

b) Evaluate the line integral $\oint_C (-y/2, x/2) \cdot r'(t)\,dt$

Parametrization: $\quad x(t) =$ $\qquad y(t) =$ $\qquad t \in [\ ,\ ]$