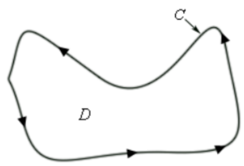
Take the simple (doesn't intersect) closed curve C below and let D be the region enclosed by the curve.



Positive Orientation: The direction placed on the curve is in the counterclockwise direction. (as the curve is traced region D is always on the left)

Green's Theorem

Let C be a positively oriented, piecewise smooth, simple, closed curve and let D be the region enclosed by the curve. If P and Q have continuous first order partial derivatives on D then,

$$\int_C P dx + Q dy = \iint_D \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y} \right) dA$$

Alternate notations:

$$\oint_C P dx + Q dy$$

1. Use Green's Theorem to evaluate $\oint_C xy\,dx + x^2 y^3 dy$ where C is the triangle with vertices $(0, 0)$, $(1, 0)$, $(1, 2)$ with positive orientation

2. Evaluate $\oint_C y^3\,dx - x^3 dy$ where C is the positively oriented circle of radius 2 centered at the origin.