Consider the line integral

$$\int_C -y^3\,dx + x^3\,dy$$

where C is the positively-oriented unit circle.

1. Parametrize C and convert this line integral into a regular 1-dim integral. Do not evaluate.
2. Use Green's Theorem to convert this line integral into a double integral. Evaluate this integral.

1. $\vec{c}(t) = \cos t\,\vec{i} + \sin t\,\vec{j}$

$\vec{c}'(t) = -\sin t\,\vec{i} + \cos t\,\vec{j}$

$$\int_C -y^3\,dx + x^3\,dy =$$

$$\int_0^{2\pi} \sin^4 t + \cos^4 t\,dt$$

2. $$\iint_{0 \le x^2+y^2 \le 1} 3x^2 + 3y^2\,dA =$$

$$\int_0^{2\pi}\int_0^1 (3r^2)\,r\,dr\,d\theta =$$

$$\int_0^{2\pi}\int_0^1 3r^3\,dr\,d\theta =$$

$$\frac{3}{4}\int_0^{2\pi} d\theta = \frac{3}{4}(2\pi)$$

$$= \frac{3\pi}{2}.$$