

$$F = (x-y)^2 + (x+y)^2$$

Since region is closed, we will use Green's Theorem

$$\oint F \cdot d\mathbf{n} = \iint \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) = \iint 1 - (-1) \, dx \, dy$$

$$= 2 \iint_A dx \, dy$$

$$= 2 \times \text{area of } A$$

$$= 2 \times \frac{[\pi(4)^2 - \pi(1)^2]}{4}$$

$$\Rightarrow \frac{1}{2} (16\pi - \pi) = \boxed{\frac{15\pi}{2}} \quad \leftarrow$$

