

## Gradient of distance function

$$\rho(q) = |(q - q_0)| = \sqrt{(x - x_0)^2 + (y - y_0)^2}$$

Gradient :

$$\frac{\partial \rho}{\partial x} = \frac{2(x - x_0)}{2\sqrt{(x - x_0)^2 + (y - y_0)^2}} = \frac{(x - x_0)}{\sqrt{(x - x_0)^2 + (y - y_0)^2}}$$

$$\frac{\partial \rho}{\partial y} = \frac{2(y - y_0)}{2\sqrt{(x - x_0)^2 + (y - y_0)^2}} = \frac{(y - y_0)}{\sqrt{(x - x_0)^2 + (y - y_0)^2}}$$

$$\left(\frac{\partial \rho}{\partial x}, \frac{\partial \rho}{\partial y}\right) = \frac{(q - q_0)}{\rho(q)}$$