

Arc-length

Remember: $ds = \sqrt{(dx)^2 + (dy)^2}$



so $dA = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$

Therefore $s = \int_{t_0}^{t_1} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt,$

for the arc-length of the part of the curve swept out for t going from t_0 to t_1 .

Example:
$$\begin{cases} x = rt - r \sin t \\ y = r - r \cos t \end{cases} \quad 0 \leq t \leq 2\pi.$$