Arc Length

For a function, $f(x)$

$$L = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx$$

For a polar graph, r(θ)

$$L = \int_{\theta 1}^{\theta 2} \sqrt{[r(\theta)]^2 + [r'(\theta)]^2}\, d\theta$$

BC Only: Arc Length (Length of a Curve)

A. If the function $y = f(x)$is a differentiable function, then the length of the arc on [a, b] is

$$\int_a^b \sqrt{1 + [f'(x)]^2}\, dx$$

B. If the function $x = f(y)$is a differentiable function, then the length of the arc on [a, b] is

$$\int_a^b \sqrt{1 + [f'(y)]^2}\, dy$$

C. Parametric Arc Length: If a smooth curve is given by ***x(t)*** and ***y(t)***, then the arc length over the interval $a \le t \le b$ is

$$\int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt$$

Arc Length of a Function:

For a function $f(x)$ with a continuous derivative on $[a, b]$:

Arc Length is: $s = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx$