**Arc Length Formula for** $y = f(x)$: If $f'$ is continuous on $[a, b]$, then the length of the curve $y = f(x)$, $a \leq x \leq b$, is

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

Using our other notation for derivatives, we can rewrite the arc length formula as

$$L = \int_{a}^{b} \sqrt{1 + \left( \frac{dy}{dx} \right)^2} \, dx$$

**Arc Length Formula for** $x = g(y)$: If $g'$ is continuous on $[c, d]$, then the length of the curve $x = g(y)$, $c \leq y \leq d$, is

$$L = \int_{c}^{d} \sqrt{1 + [g'(y)]^2} \, dy$$

Using our other notation for derivatives, we can rewrite the arc length formula as

$$L = \int_{c}^{d} \sqrt{1 + \left( \frac{dx}{dy} \right)^2} \, dy$$
EXAMPLES: Find the length of the curve.

1. $y = \ln(\cos x), \quad 0 \leq x \leq \frac{\pi}{3}$

2. $y^2 = 4x, \quad 0 \leq y \leq 2$