Arc Length Formula for $y = f(x)$: If f' is continuous on $[a, b]$, then the length of the curve $y = f(x),\ a \le x \le b$, 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 $x = g(y),\ c \le y \le d$, 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. $y = \ln(\cos x), \quad 0 \leq x \leq \dfrac{\pi}{3}$

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