An ant is walking along a curve from point A to point B. How far did he travel? We can use the distance formula to help us answer this question and others like it.

Let the function given by $y = f(x)$ represent a smooth curve on the interval $[a,b]$. The arc length of $f$ between $a$ and $b$ is

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

Ex. Find the arc length of the graph of $y = \frac{x^3}{6} + \frac{1}{2x}$ on the interval $[\frac{1}{2}, 2]$. 
Okay, now you try. Find the arc length of the graph of

\[ y = \ln(\cos x) \text{ from } x = 0 \text{ to } x = \frac{\pi}{4} \]