

Arc Length

If a function is continuous on $[a, b]$ then the length of the curve from a to b is:

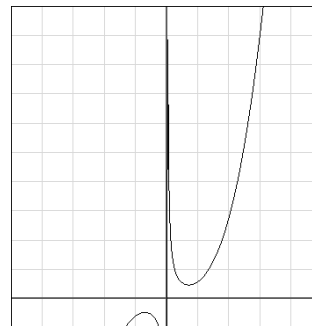
$$L = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$$

If a function is continuous on $[c, d]$ then the length of the curve from c to d is:

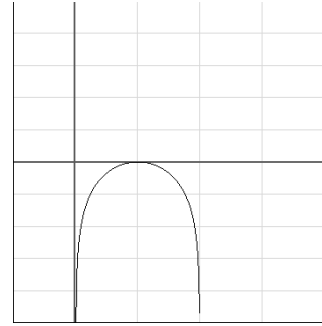
$$L = \int_c^d \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy$$

Directions: Find the length of each curve.

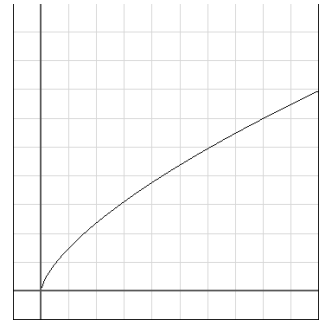
1. $y = \frac{x^3}{3} + \frac{1}{4x}$, $1 \leq x \leq 3$



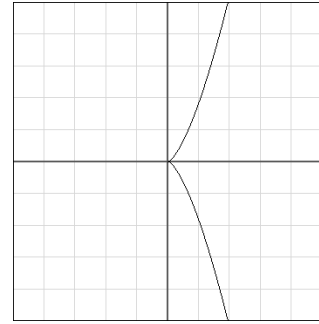
2. $y = \ln(\sin x)$, $\frac{\pi}{4} \leq x \leq \frac{2\pi}{3}$



3. $y = \frac{3}{2}x^{\frac{2}{3}}$, $[0,8]$



4. $27x^3 = 8y^2$, from $(0,0)$ to $\left(1, \frac{3\sqrt{6}}{4}\right)$



5. $x = \frac{y^3}{2} + \frac{1}{6y}$, $1 \leq y \leq 3$

