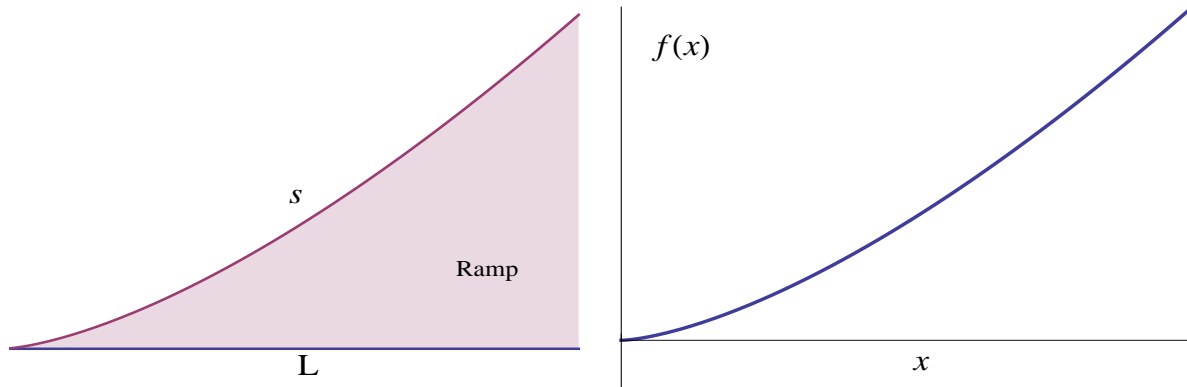


5. [8 points] A company wants to design a bicycle ramp using the shape of the graph of the function $f(x) = \frac{4}{3}x^{\frac{3}{2}}$, where x is the length in meters of the base of the ramp.



Find the length s of a ramp with base of length L . Show all your work.

Solution:

$$\begin{aligned}
 s &= \int_0^L \sqrt{1 + (f'(x))^2} dx \\
 &= \int_0^L \sqrt{1 + (2\sqrt{x})^2} dx \\
 &= \int_0^L \sqrt{1 + 4x} dx \\
 &= \frac{1}{6} (1 + 4x)^{3/2} \Big|_0^L \\
 &= \frac{1}{6} (1 + 4L)^{3/2} - \frac{1}{6}
 \end{aligned}$$