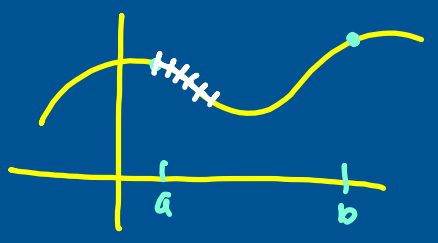
Length of Curve



distance formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$\lim_{x_2 \to x_1} \sum_{x=a}^{b} \sqrt{\frac{(x_2 - x_1)^2}{(x_2 - x_1)^2} + \frac{(y_2 - y_1)^2}{(x_2 - x_1)^2}}$$

$$\int_a^b \sqrt{1 + \left(\frac{y_2 - y_1}{x_2 - x_1}\right)^2}$$

$$\int_a^b \sqrt{1 + \left(\frac{f(x_2) - f(x_1)}{x_2 - x_1}\right)^2}$$

$$\boxed{\int_a^b \sqrt{1 + [f'(x)]^2}\, dx}$$

Find length of curve.

$f(x) = \frac{2}{3}(x-1)^{3/2}$ $[1, 4]$

$f'(x) = (x-1)^{1/2} \cdot 1$

$$\int_1^4 \sqrt{1 + \left[(x-1)^{1/2}\right]^2}\, dx$$

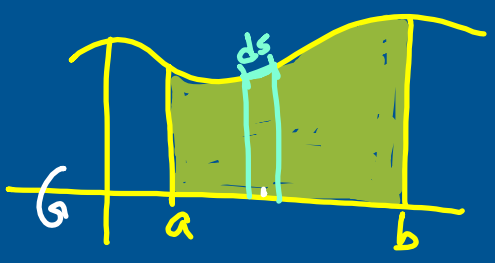
$$\int_1^4 \sqrt{x + x - x}$$

$$\int_1^4 x^{1/2}\, dx$$

$$\frac{2}{3} x^{3/2} \Big|_1^4$$

$$\frac{2}{3}\left[8 - 1\right] = \boxed{\frac{14}{3} \text{ units}}$$

Surface Area of a Solid of Revolution



$2\pi r \cdot h$

$2\pi r \, ds$

$2\pi f(x) \, ds$

$$2\pi \int_a^b f(x)\sqrt{1+[f'(x)]^2}\,dx$$

$f(x) = \sqrt{1-x^2} \quad [0, \frac{1}{2}]$

$f'(x) = \frac{1}{2}(1-x^2)^{-1/2} \cdot -2x$

$= \frac{-x}{\sqrt{1-x^2}}$

$$2\pi \int_0^{1/2} \sqrt{1-x^2} \cdot \sqrt{1+\left[\frac{-x}{\sqrt{1-x^2}}\right]^2}\,dx$$

$= \pi$ units^2