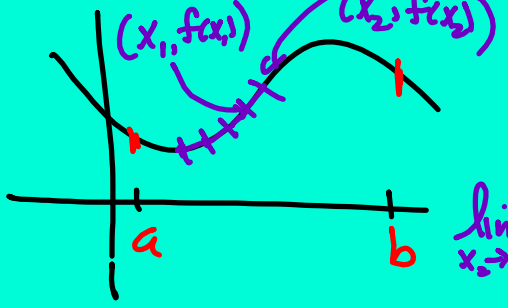
Length of Curve & Surface Area



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

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

$$\text{Length of curve} = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx$$

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

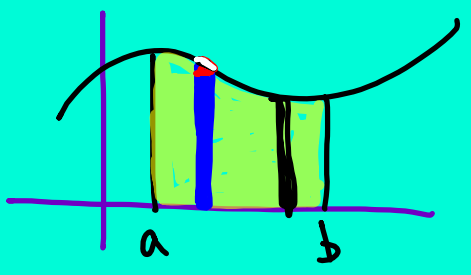
$$f'(x) = (x-1)^{1/2} \cdot 1$$

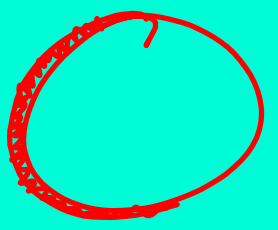
$$\int_1^4 \sqrt{1 + \left[(x-1)^{1/2}\right]^2}\, dx$$

$$\int_1^4 \sqrt{1 + x - 1}$$

$$\int_1^4 \sqrt{x}\, dx = \frac{14}{3} \text{ units}$$

Surface Area





$2\pi r\, ds$

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

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

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

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

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