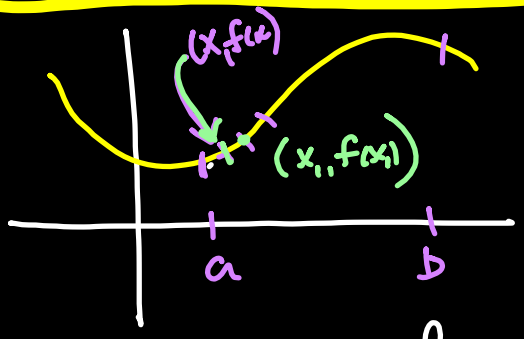
Length of Curve + Surface Area



Distance Formula

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

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

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

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

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

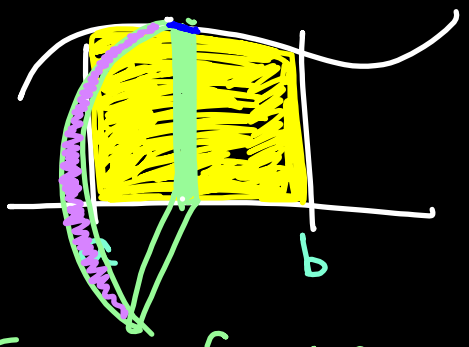
$$\int_1^4 \sqrt{1 + [(x-1)^{1/2}]^2}\, dx$$

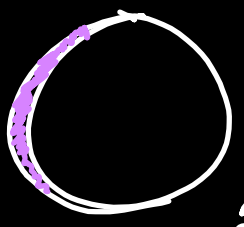
$$\int_1^4 \sqrt{1 + x - 1}\, dx$$

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

$$\frac{2}{3}x^{3/2}\Big|_1^4 = \frac{2}{3}[8 - 1] = \frac{2}{3} \cdot 7 = \frac{14}{3} \text{ units}$$

Surface Area of a Solid of Revolution





$2\pi r\, ds$

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

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

Find surface area.

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

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

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

#17 $y = (3x)^{1/3}$

$0 \le x \le 8/3$

around y-axis

1) Change to $x = y$'s
2) Change limits to y-coord.