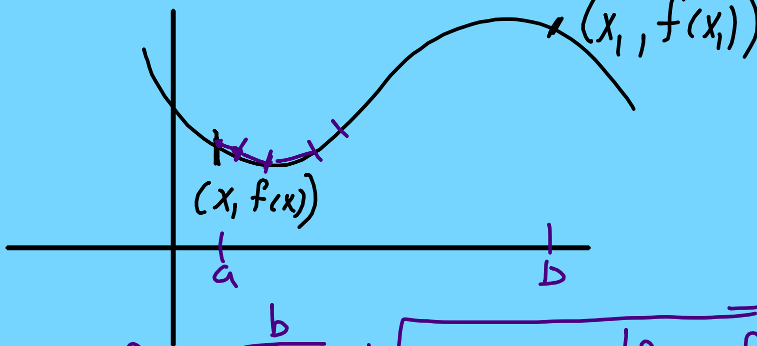
LENGTH OF CURVE + SURFACE ARE



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

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

$$\sqrt{3x+2}$$

$$\sqrt{x+\tfrac{2}{3}}$$

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

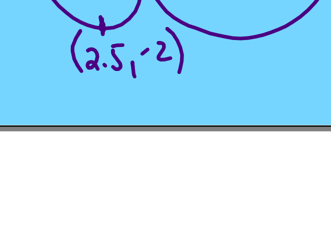
$$* \quad f(x) = \frac{2}{3}(x-1)^{3/2} \qquad [1, 4]$$

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

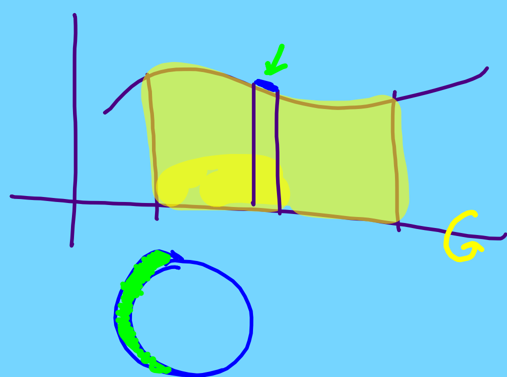
$$\int_1^4 \sqrt{1 + \left[(x-1)^{\cancel{1/2}}\right]^{\cancel{2}}}\, dx$$

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

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



SURFACE AREA OF A SOLID OF REVOLUTION



$$2\pi \int_a^b r \cdot \text{length of curve}$$

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

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

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

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

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

$$= \boxed{\pi \text{ units}^2}$$

10.

$y = x \quad x = y$

$y = 2x \quad x = \frac{y}{2}$

$x + y = 6 \quad x = 6 - y$

$$2\pi \int_a^b r\,(f - g)\,dx$$

$$2\pi \int_0^3 y\left(y - \frac{y}{2}\right)dy$$

$$+\,2\pi \int_3^4 y\left(6 - y - \frac{y}{2}\right)dy$$

$$= 14\pi \text{ units}^3$$