Fundamental Theorem of Calculus (#1)

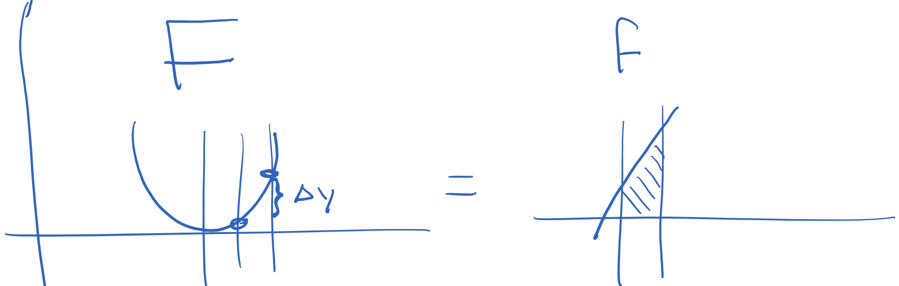
If $f(x)$ is continuous on $[a,b]$ and F is an antiderivative of f.

$$F(x) = \int f(x)\,dx$$

$$\boxed{\text{Then: } \int_a^b f(x)\,dx = F(b) - F(a)}$$

Accumulation

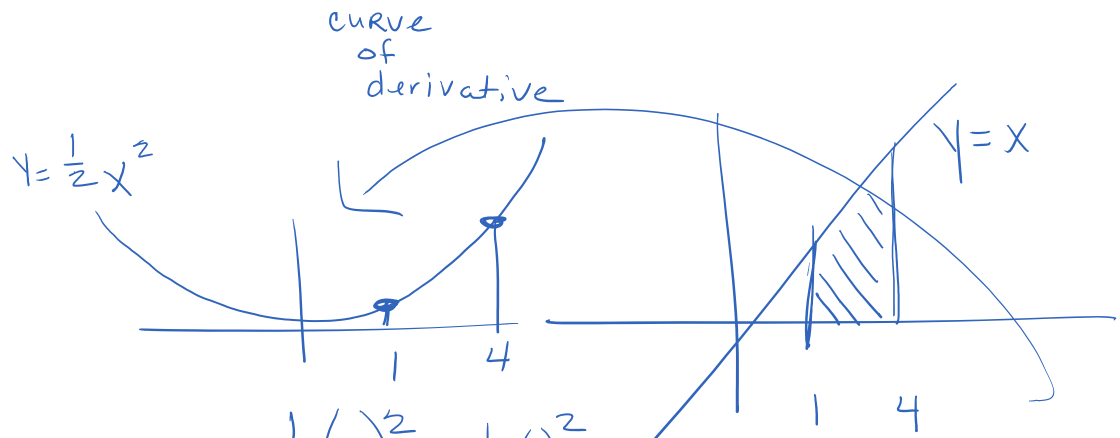
The Change in the position curve is the area under the velocity curve



$F(b) - F(a)$ = Area under f.

$$\int_a^b f(x)\,dx = F(b) - F(a)$$

area under curve of derivative $= \Delta y$



$\frac{1}{2}(4)^2 - \frac{1}{2}(1)^2$ $\qquad$ $\frac{1}{2}(1+4)\cdot 3$

$$\boxed{\text{The change in position} = \text{Area under Slope Function}}$$

Area under rate of change

displacement $\xrightarrow{\frac{d}{dx}}$ velocity $\rightarrow$ acceleration

change of position $\leftarrow$ $\int V$ $\leftarrow$

$$\int_1^4 x\,dx = \frac{1}{2}x^2 + C \Big|_1^4$$

$$\left[\tfrac{1}{2}(4)^2 + C\right] - \left[\tfrac{1}{2}(1)^2 + C\right]$$

$F(4) - F(1)$

$8 - \frac{1}{2} = \boxed{7\tfrac{1}{2}}$

$7\frac{1}{2}$ is the area under the derivative curve

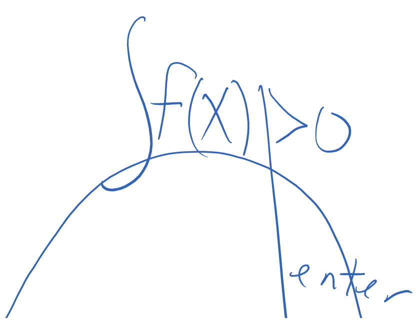
= change of y values on Antiderivative curve.

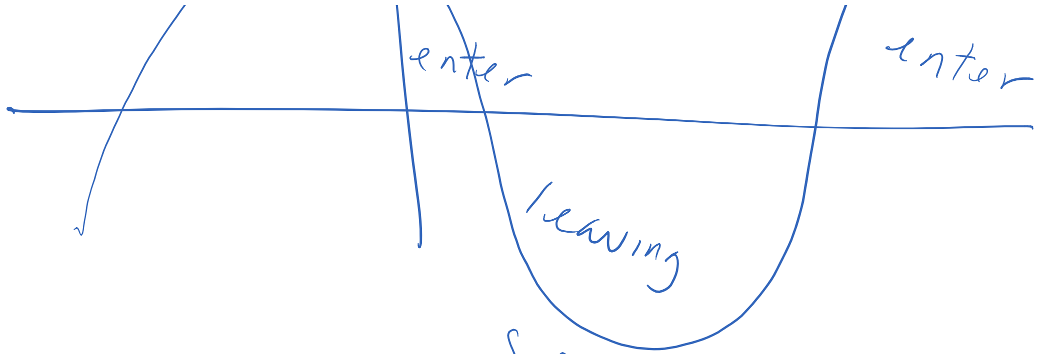
F	f
# of People in park.	Rate at which people enter park

# of people who entered the park between 1:00 and 4:00 $= \int_1^4 f(x)\,dx$

Accumulation

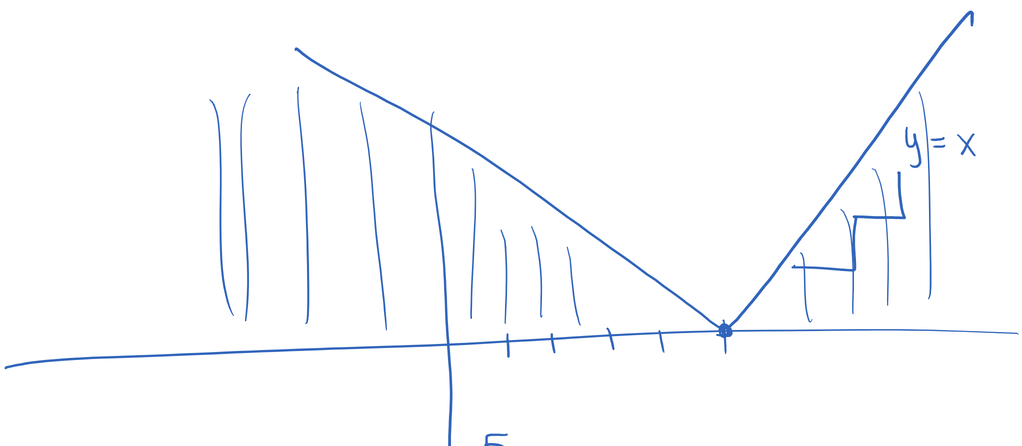
Recall: if $f(x)$ is non-negative on $[a,b]$ Area btwn the x axis and $f(x)$ on $[a,b]$ $= \int_a^b f(x)\,dx$





$\int f(x) < 0$

$$\int_{-4}^{10} |x-5|\,dx$$



$$\int_{-4}^{10} |x-5|\,dx \Longrightarrow \int_{-4}^{5} -(x-5)\,dx \quad \int_{5}^{10} (x-5)\,dx$$

$$\int_{-1}^{5} (x^7 - 2x^6 + 3)\,dx$$

$$\boxed{26{,}524.285}$$

$\boxed{26{,}524.285}$