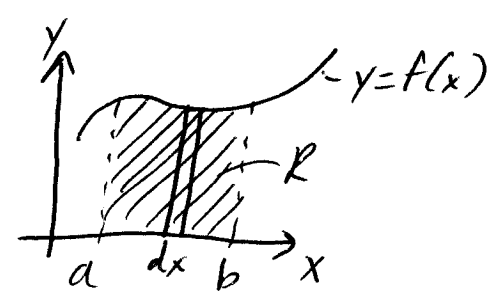


Math 16B

Vogler

Applications of the Definite Integral

I)



Area of $R = \int_a^b f(x) \cdot dx$

Sum from $x=a$ to $x=b$

height $\nwarrow$ width $\swarrow$

II) If $A(x)$ is the cross-sectional area of a 3D-solid from $x=a$ to $x=b$, then the volume of the solid is

Total Volume = $\int_a^b A(x) \cdot dx$

Sum from $x=a$ to $x=b$

Area $\nwarrow$ Width $\swarrow$

III) If $f(t)$ is velocity ($\frac{\text{distance}}{\text{time}}$), then distance traveled for $t=a$ to $t=b$ is

Total Distance = $\int_a^b f(t) dt$

Sum from $t=a$ to $t=b$

velocity = $\frac{\text{distance}}{\text{time}}$ $\nwarrow$ time $\swarrow$

IV) If $f(x)$ is the density ($\frac{\text{mass}}{\text{length}}$) of a wire from $x=a$ to $x=b$, then the total mass of the wire is

Total Mass = $\int_a^b f(x) dx$

Sum from $x=a$ to $x=b$

density = $\frac{\text{mass}}{\text{length}}$ $\nwarrow$ length $\swarrow$

Ex 1) Water is leaking from a faucet at the rate of $\sqrt{t}$ gal/hr for $0 \leq t \leq 4$, t in hours.

a) How fast is water leaking when $t=1$ hr?
 $t=4$ hr?

b) What is the total amount of water lost to leakage for $0 \leq t \leq 4$?

2) Snow is falling at the rate of $\frac{3}{t+1}$ in/hr.
for $0 \leq t \leq 9$, t in hours.

a) At what rate is snow falling when $t=0$ hr?
 $t=5$ hr?

b) What is the total accumulation of snow for $0 \leq t \leq 9$?