

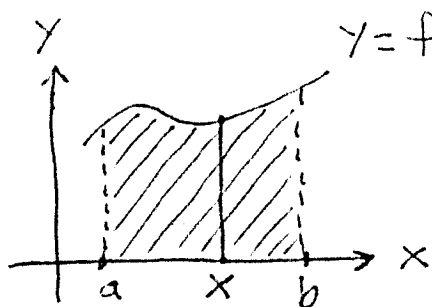
Math 16B

Kouba

Applications of the Definite Integral

I.)

Recall:



$$\text{Area} = \int_a^b f(x) dx$$

↑ ↑
height width

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

$$\text{Distance} = \int_a^b f(t) dt$$

↑ ↑
 $\frac{\text{distance}}{\text{time}}$ time

III.) 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

$$\text{Mass} = \int_a^b f(x) dx$$

↑ ↑
 $\frac{\text{mass}}{\text{length}}$ length

IV. 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

$$\text{Volume} = \int_a^b A(x) dx$$

↑ ↑
area length

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

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

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

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