Math 181  Monday, February 1  Section 6.2

Theme: Add up lots of little pieces

\[ A(x) \]

Cross-sectional area

Tues 6PM 6.3
Thu 6.3/6.4
Fri 6.4
BYOB Beer Scene
Find the volume of the pyramid with height 10 and square base size 5.

Side length of square cross-section: $A(y) = (2s)^2 = (2(\sqrt{y}))^2 = \frac{y^2}{4}$

Volume:

$$V = \int_0^{10} A(y) \, dy = \int_0^{10} \frac{y^2}{4} \, dy$$

One, two, three.
A rod has charge density $q(x) = x^3$ for $0 \leq x \leq 5$. Electric field at $x=8$ is inversely proportional to square of distance from the rod.

Define $\Delta E$ due to $\Delta x$:

$$\Delta E = \left( \frac{q(x) \Delta x}{(8-x)^2} \right) \frac{1}{8-x}$$

Total electric field $E$:

$$E = \int \Delta E$$

$$E = \int_{x=0}^{x=5} \frac{x^3 \Delta x}{(8-x)^2}$$

$$E = \int_{x=0}^{x=8-u} \frac{u \Delta u}{u^2}$$

$$E = \frac{1}{2}$$
Average value of $f(x)$ on $[a, b]$:

$$\frac{\int_{a}^{b} f(x) \, dx}{b-a}$$

Average value of 8, 3, 7, 12:

$$\frac{3+7+12}{3} = 2\sqrt{3}$$