

Day 35 is Monday, Nov 19, 2012

Please sit in groups of 3.

Section 6-5 The Fundamental Theorem of Calculus

We have seen two uses of the  $\int$  symbol.

① The Indefinite Integral  $\int f(x) dx = F(x) + C.$

where  $F(x)$  is an antiderivative of  $f(x)$ .

That is,  $F'(x) = f(x)$ .

② The Definite Integral

$\int_{x=a}^{x=b} f(x) dx = A =$  "signed area" between the graph of  $f$  and the x-axis from  $x=a$  to  $x=b$ .

When doing definite integrals, sometimes we could actually compute the ~~area~~ signed area  $A$ ,

if the region was made up of simple geometric shapes,  
 In more difficult examples, where the region was not  
 made up of simple shapes, we found approximations  
 using Riemann sums.

Example  $A \approx L_5$

Sometimes, in cases of functions that were  
 increasing, we could ~~not~~ sandwich the  
 unknown value  $A$  in between two  
 approximate values,

For example

$$L_{100} < A = \int_{x=a}^{x=b} f(x) dx < R_{100}$$

In fact, we defined

$$A = \int_{x=a}^{x=b} f(x) dx \stackrel{\text{definition}}{=} \lim_{n \rightarrow \infty} S_n = \lim_{n \rightarrow \infty} L_n = \lim_{n \rightarrow \infty} R_n$$

