

Lecture-10-9-14 Professor Shabanskaya Calculus 1760-002

Quiz on Friday

Covers: Summation & Evaluation of Sums

Area Approximation

The Definite integral

2 problems, Ten minutes at class end.

Section 6.1: The definite integral

Definition: Let f be a function defined on $[a, b]$. Then the definite integral of f on $[a, b]$ denoted by:

$$\int_a^b f(x) dx = \lim_{n \rightarrow \infty} \sum_{i=1}^n f(x_i^*) \Delta x, \text{ where provided this limit exists}$$

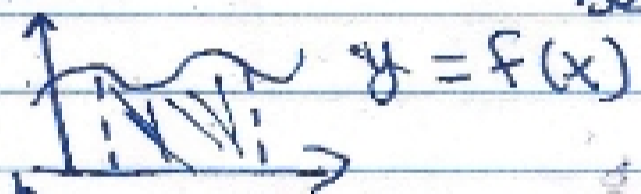
$\Delta x = \frac{b-a}{n}$ - the length of each of the n equal length sub intervals $[x_0, x_1], [x_1, x_2], [x_2, x_3], \dots, [x_{i-1}, x_i], \dots, [x_{n-1}, x_n]$ and the points x_i^* are in $[x_{i-1}, x_i]$ $i=1, 2, 3, \dots, n-1, n$

Geometric Properties:

1) If f is integrable on $[a, b]$, & $f(x) \geq 0$

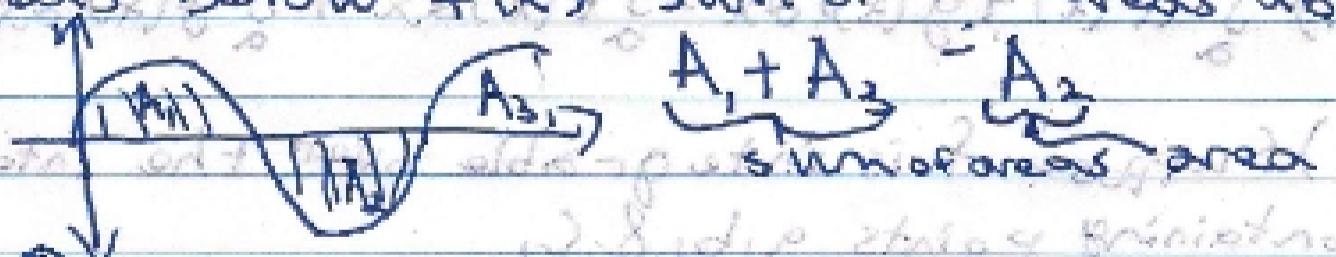
for $a < x \leq b$, then

$\int_a^b f(x) dx \geq 0$ & it is the area of the region below $f(x)$ for $a < x \leq b$



2) $\int_a^b f(x) dx =$ is integrable on $[a, b] =$ sum of the

areas below $f(x)$ - sum of the areas above $f(x)$



Ex: Use an area formula to find the value of the following $\int_a^b (1/2 x - 4) dx$ by interpreting

it as the (signed) area under the graph of \rightarrow