1. Average Value of a Function

Average value of a function

If $f(x)$ is a continuous function from a to b, the average value of $f(x)$ from a to b is

$$\text{Average value of } f(x) \text{ from } a \text{ to } b = \frac{\int_a^b f(x)dx}{b-a}$$

Unit is the same as $f(x)$

2. Average value of the Rate-of-Change

Average value of the Rate-of-Change

If $f'(x)$ is the rate-of-change of $f(x)$, the average value of the rate-of-change from a to b is

$$[\text{Average value of } f'(x) \text{ from } a \text{ to } b] = \frac{\int_a^b f'(x)dx}{b-a} = \frac{f(b)-f(a)}{b-a}$$

In fact, this is the *average rate of change* of $f(x)$ from a to b.

Example: Electronics Sales. Textbook page399 U.S. factory sales of electronic goods to dealers from 1990 through 2001 can be modeled as where output is measured in billion dollars and t is the number of years since 1990.

Sale Function $s(t) = 0.0388t^3 - 0.495t^2 + 5.698t + 43.6$

a.) Calculate the **average annual value** of U.S. factory sales of electronic goods to dealers from 1990 through 2001.

$$\frac{\int_0^{11} s(t)\,dt}{11-0} = \frac{\left.\frac{0.0388}{4}t^4 - \frac{0.495}{3}t^3 + \frac{5.698}{2}t^2 + 43.6t\right|_0^{11}}{11-0} \approx 67.885$$

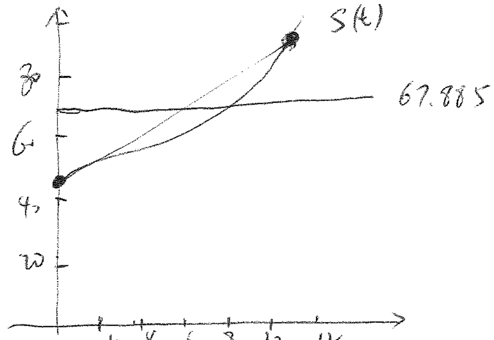
billion dollars

Use MATH/fnIntC Check. $\int_{\boxed{a}}^{\boxed{b}} \boxed{f(x)}\, d\boxed{x}$ | fnInt$(f(x), x, a, b)$

b.) Calculate the **average rate of change** of U.S. factory sales of electronic goods to dealers from 1990 through 2001.

$$\frac{\int_0^{11} s'(t)\,dt}{11-0} = \frac{S(11)-S(0)}{11-0} \approx 4.948 \text{ billion dollars per year}$$

c.) Sketch a graph of s from 1990 through 2001 and illustrate the answer to parts a and b on the graph.



Example: The revenue of a company in millions of dollars, x years after 1990 are approximated in the following table:

0 2 4 6 8 10 12

Years	1990	1992	1994	1996	1998	2010	2012
Revenue	2	4.5	10.5	15	17.5	18.5	19

1. Let $R(x)$ be the company's revenue x years after 1990. Use the table above to fit the logistic model for $R(x)$. Give your model with 3 decimal places and with units.

$$R(x) = \frac{c}{1+a\cdot e^{-bx}}$$

$a = 9.722$

$b = 0.606$

$c = 18.971$

millions of dollars

2. Find the average value of R(x) between 1991 and 1999.

$$\frac{\int_1^9 R(x)\,dx}{9-1} \approx \frac{95.403}{8} \approx 11.925 \text{ million dollars}$$