Definition of the Average Value of a Function on an Interval

If f is integrable on the closed interval [a, b], then the average value of f on the interval is

$$\frac{1}{b-a}\int_a^b f(x)dx.$$

Theorem : Mean Value Theorem for Integrals

If f is continuous on the closed interval [a, b], then there exists a number c in the closed interval [a, b] such that

$$\int_a^b f(x)dx = f(c)(b-a).$$

Theorem : Integration of Even and Odd Functions

Let f be integrable on the closed interval [-a, a].

1. If f is an even function, then $\int_{-a}^{a} f(x)dx = 2\int_0^a f(x)dx$

2. If f is an odd function, then $\int_{-a}^{a} f(x)dx = 0.$

(Note : See "Basic Math" for a defintion of an even and odd function)

Leibniz' Rule

$$\frac{d}{dx}\left[\int_{u(x)}^{v(x)} f(t)dt\right] = f(v)\frac{dv}{dx} - f(u)\frac{du}{dx}$$

or

$$\frac{d}{dx}\left[\int_{u(x)}^{v(x)} f(x,t)dt\right] = f(x,v)\frac{dv}{dx} - f(x,u)\frac{du}{dx} + \int_u^v \frac{\partial f}{\partial x}dt.$$