The following definite integrals are all equal and the variables $x, t$ and $y$ are called dummy variables.

$$\int_a^b f(x)\,dx = \int_a^b f(t)\,dt = \int_a^b f(y)\,dy$$

*The value of a definite integral is unaffected if we change the letter used for the variable of integration, but do not change the limits of integration.*

**The Second Fundamental Theorem of Calculus**

Let $f$ be a continuous function on an interval $I$, and let $a$ be any point in $I$. If $F$ is defined by $F(x) = \int_a^x f(t)\,dt$ then $F'(x) = f(x)$ at each point $x$ in the interval $I$.

Expressed as a formula: $$\frac{d}{dx}\left[\int_a^x f(t)\,dt\right] = f(x)$$

*Where the integrand is continuous, the derivative of a definite integral with respect to its upper limit is equal to the integrand evaluated at the upper limit.*

Two other results of the Second Fundamental Theorem of Calculus

(1) $$\frac{d}{dx}\left[\int_a^{g(x)} f(t)\,dt\right] = f(g(x))\cdot g'(x)$$

(2) $$\frac{d}{dx}\left[\int_{h(x)}^{g(x)} f(t)\,dt\right] = f(g(x))\cdot g'(x) - f(h(x))\cdot h'(x)$$