8.3 Definition and Properties of the Derivative

Functions: f, g, y, u, v
Independent variable: x
Real constant: k
Angle: α

764. $y'(x) = \lim\limits_{\Delta x \to 0} \dfrac{f(x+\Delta x) - f(x)}{\Delta x} = \lim\limits_{\Delta x \to 0} \dfrac{\Delta y}{\Delta x} = \dfrac{dy}{dx}$

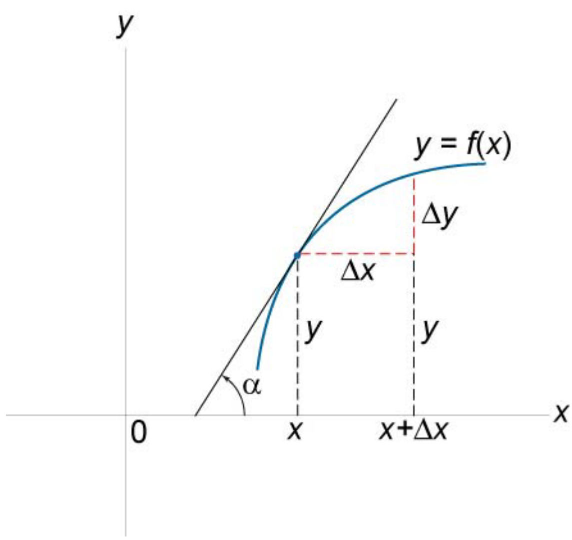

Figure 175.

765. $\dfrac{dy}{dx} = \tan\alpha$

766. $\dfrac{d(u+v)}{dx} = \dfrac{du}{dx} + \dfrac{dv}{dx}$

767. $$\frac{d(u-v)}{dx}=\frac{du}{dx}-\frac{dv}{dx}$$

768. $$\frac{d(ku)}{dx}=k\frac{du}{dx}$$

769. Product Rule

$$\frac{d(u\cdot v)}{dx}=\frac{du}{dx}\cdot v+u\cdot\frac{dv}{dx}$$

770. Quotient Rule

$$\frac{d}{dx}\left(\frac{u}{v}\right)=\frac{\frac{du}{dx}\cdot v-u\cdot\frac{dv}{dx}}{v^2}$$

771. Chain Rule

$y=f(g(x)),\ u=g(x),$

$$\frac{dy}{dx}=\frac{dy}{du}\cdot\frac{du}{dx}.$$

772. Derivative of Inverse Function

$$\frac{dy}{dx}=\frac{1}{\frac{dx}{dy}},$$ y .

where $x(y)$ is the inverse function of (x)

773. Reciprocal Rule

$$\frac{d}{dx}\left(\frac{1}{y}\right)=-\frac{\frac{dy}{dx}}{y^2}$$

774. Logarithmic Differentiation

$y=f(x),\ \ln y=\ln f(x),$

$$\frac{dy}{dx}=f(x)\cdot\frac{d}{dx}[\ln f(x)].$$