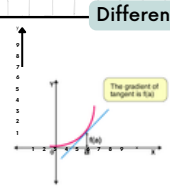
Types of Calculus

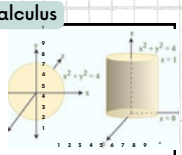
Differential Calculus



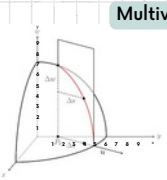
Differential calculus deals with rates of change and slopes of curves. It involves calculating derivatives - the rate at which a function's output changes compared to changes in the input. The derivative describes the slope of the tangent line to a function at a given point.

Integral Calculus

Integral calculus deals with the accumulation of quantities and the areas under and between curves. It involves calculating integrals - the sum of infinitesimally small pieces that make up a whole. The integral calculates the area under a curve by adding up adjoining rectangular strips.



Multivariable Calculus



Multivariable calculus provides tools to analyze functions of several variables, vector fields, volumes, physical systems and much more. It laid the foundation for modeling our multidimensional world mathematically.

Vector Calculus

Vector calculus provides essential tools for working with vector fields, spatially-dependent phenomena, and functions of several variables. It is used extensively in physics, engineering, and other sciences.

$$\nabla\left(\frac{\psi}{\phi}\right) = \frac{\phi\nabla\psi - \psi\nabla\phi}{\phi^2}$$

$$\nabla\left(\frac{\mathbf{A}}{\phi}\right) = \frac{\phi\nabla\mathbf{A} - \nabla\phi\otimes\mathbf{A}}{\phi^2}$$

$$\nabla\cdot\left(\frac{\mathbf{A}}{\phi}\right) = \frac{\phi\nabla\cdot\mathbf{A} - \nabla\psi\cdot\mathbf{A}}{\phi^2}$$

$$\nabla\times\left(\frac{\mathbf{A}}{\phi}\right) = \frac{\phi\nabla\times\mathbf{A} - \nabla\psi\times\mathbf{A}}{\phi^2}$$

$$\nabla^2\left(\frac{\psi}{\phi}\right) = \frac{\phi\nabla^2\psi - 2\phi\nabla\left(\frac{\psi}{\phi}\right)\cdot\nabla\phi - \psi\nabla^2\phi}{\phi^2}$$