# [Glossary]
# [Concept of Level set & Partial Differentiation]

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| **Subject:** | Business Economics |
| **Course:** | B.A., 2nd Semester, Undergraduate |
| **Paper No. & Title:** | Paper – 202 (Two Zero two) Mathematics for Business Economics |
| **Unit No. & Title:** | Unit - 5 Functions of two variables |
| **Lecture No. & Title:** | 1(One): Concept of Level set & Partial Differentiation |

**Glossary:**

**Endogenous Variable**: Variable that is derived internally.

**Exogenous Variable:** Variable that is derived externally.

**Homogeneous Functions:** A function $f: R^n \to R$ satisfying the condition $f(tx_1, tx_2, ..., tx_n) = t^k f(x_1, x_2, ..., x_n)$ for some fixed $k$ is called a homogeneous function of degree $k$ in $n$ variables.

**Homothetic Functions:** A monotonic transformation of a homogeneous function is called homothetic function.

**Level Curve:** The Graphical Representation of a Level Set of $R^2$ is called a Level Curve in $R^2$.

**Level Set:** Let $f$ be a function of two variables. A collection of points defined by $L_c(f) = \{(x, y): f(x, y) = c\}$ for some fixed $c \in R$ is called a Level Set of function $f$ in $R^2$ for the value $c$ and similarly a level set in $R^3$ can also be defined.

**Level Monotonically Increasing Function: Surface:** The Graphical Representation of a Level Set of $R^3$ is called a Level Surface in $R^3$.

**Monotonically Decreasing Function:** A real valued function $f: R \to R$ is said to be monotonically decreasing function if $x_1 \le x_2 \Rightarrow f(x_1) \ge f(x_2)$ for all $x_1, x_2 \in R$.

A real valued function $f: R \to R$ is said to be monotonically increasing function if $x_1 \le x_2 \Rightarrow f(x_1) \le f(x_2)$ for all $x_1, x_2 \in R$.

**Partial Derivatives:** The process of differentiating a function of several variables with respect to a variable keeping all other variables fixed is called Partial Differentiation.

Suppose $f$ is a real valued function of two independent variables and $(x_0, y_0)$ is a point in its domain. The First Order Partial Derivative of $f$ with respect to $x$ at point $(x_0, y_0)$ is defined as $\lim_{h \to 0} \frac{f(x_0 + h, y_0) - f(x_0, y_0)}{h}$, provided this limit exists. This First Order Partial Derivative of $f$ w.r.t. $x$ at point $(x_0, y_0)$ is denoted by $f_x(x_0, y_0)$ or $\frac{\partial f}{\partial x}(x_0, y_0)$ or $D_x f$.