

# Bright Career Science Academy Narowal

## Important Definitions "Calculus & Analytic Geometry" (Math-12)

**Chapter No. <1> Function:** A function is rule relating two sets in such a way that each element in the first set corresponds to one and only one element in the second set.

**Polynomial Function:** A function of the form  $P(x) = a_0x^0 + a_1x^1 + a_2x^2 + \dots + a_{n-1}x^{n-1} + a_nx^n$  is called polynomial function where  $n \in W$  and  $a_0, a_1, a_2, \dots, a_n \in R$ .

**Linear Function:** A function of the form  $f(x) = ax + b$  where  $a, b \in R$  and  $a \neq 0$  is called linear function.

**Identity Function:** A function of the form  $f(x) = x$  is called Identity function.

**Constant Function:** A function of the form  $f(x) = c$  where  $c \in R$  is called constant function.

**Rational Function:** A function of the form  $\frac{P(x)}{Q(x)}$  where  $P(x)$  and  $Q(x)$  are polynomials and  $Q(x) \neq 0$  is called rational function.

**Exponential Function:** A function in which variable appear as power of a constant is called exponential Function. E.g.  $y = 2^x$ ,  $y = e^x$ .

**Logarithmic Function:** The functions  $f(x) = \log a^x$  and  $f(x) = \log e^x$  are called general and natural logarithmic function respectively.

**Explicit Function:** If  $y$  is easily expressed in term of  $x$  then  $y$  is called an explicit function. E.g.  $y = x^2 + 3x$ ,  $y = \sqrt{x^2 + 1}$ .

**Implicit Function:** If  $y$  is not expressed in term of  $x$  then  $y$  is called an implicit function. E.g.  $x^2 + xy + y^2 = 4$ .

**Even Function:** A function  $f(x)$  is said to be an even function if  $f(-x) = f(x)$ .

**Odd Function:** A function  $f(x)$  is said to be an odd function if  $f(-x) = -f(x)$ .

**Parametric Function:** A function in which  $x$  and  $y$  are expressed as functions of a third variable is called parametric function.

**Inverse Function:** Let  $f(x)$  be a bijective function from  $A$  to  $B$  then its inverse is  $f^{-1}(x)$  which is onto function from  $B$  to  $A$ .

**Limit Of A Function:** Let  $f(x)$  be a function if the value of  $f(x)$  tend to a fixed number "L" as  $x$  tends to  $a$  then "L" is called limit of  $f(x)$  as  $x$  tends to  $a$ . It is written as  $\lim_{x \rightarrow a} f(x) = L$ .

**Continuous Function:** A function  $f(x)$  is said to be continuous at  $x = c$  if:

(i)  $f(c)$  is defined (ii)  $\lim_{x \rightarrow c} f(x)$  exists (iii)  $\lim_{x \rightarrow c} f(x) = f(c)$ .

B C S A

**Discontinuous Function:** Any function which is not continuous is called discontinuous function.

**Sandwich Theorem:** Let  $f, g$  and  $h$  be functions such that  $f(x) \leq g(x) \leq h(x)$ , If  $\lim_{x \rightarrow c} f(x) = L$  and  $\lim_{x \rightarrow c} h(x) = L$  then  $\lim_{x \rightarrow c} g(x) = L$ .

**Chapter No. <2> Derivative:** The rate of change of a function with respect to independent variable is called Derivative.

**OR** The derivative of a function  $y = f(x)$  with respect to  $x$  is denoted by  $\frac{dy}{dx}$  or  $f'(x)$  defined as  $\frac{dy}{dx} = \lim_{\delta x \rightarrow 0} \frac{\delta y}{\delta x} = \lim_{\delta x \rightarrow 0} \frac{f(x + \delta x) - f(x)}{\delta x}$ .

**Point Of Inflection:** A point at which the function has neither maximum nor minimum value is called point of inflection.

**Critical Point:** If  $f'(c) = 0$  or  $f'(c)$  does not exist then the point  $(c, f(c))$  is called critical point of  $f(x)$ .

**Stationary Point:** Those critical points of  $f(x)$  at which  $f'(x) = 0$  are called stationary points of  $f(x)$ .

**Increasing Function:** A function  $f(x)$  is called increasing function if  $f'(x) > 0$  for all  $x \in (a, b)$ .

**Decreasing Function:** A function  $f(x)$  is called decreasing function if  $f'(x) < 0$  for all  $x \in (a, b)$ .

**Graphical Meaning Of Derivative:** Graphical meaning of derivative is the slope of tangent line to the graph of function at given point.

**Chapter No. <3> Integration or Anti-derivative:** The process of finding anti derivative is called integration.

**OR** A function  $F(x)$  is an anti-derivative of a function  $f(x)$  if  $F'(x) = f(x)$  and mathematically written as  $\int f(x) dx = F(x) + c$  Where "c" is constant of integration.

**Definite Integral:** If  $F'(x) = f(x)$  then definite integral is defined as  $\int_a^b f(x) dx = \int_a^b F'(x) dx = [F(x)]_a^b = F(b) - F(a)$ .

**Fundamental Theorem Of Calculus:** IF  $f(x)$  is continuous on  $[a, b]$  and  $F(x)$  is anti-derivative of  $f(x)$  then  $\int_a^b f(x) dx = F(b) - F(a)$ .

**Properties Of Definite Integral:** (i)  $\int_a^b f(x) dx = -\int_b^a f(x) dx$  (ii)  $\int_a^b f(x) dx = \int_a^b f(t) dt$ .

**Graphical Meaning Of Definite Integral:** Graphical meaning of definite integral is area under the curve.

P.T.O

**Compiled By: Muzzammil Subhan**

**Contact No: 0300-7779500**

**M.Phil. Math (Minhaj University Lahore)**

**Website: [www.narowalpk.com](http://www.narowalpk.com)**

**M.Sc. Math (Quaid-i-Azam University, Islamabad)**

**Email: [info@narowalpk.com](mailto:info@narowalpk.com)**

**M.Ed. (University of Sargodha), B.Sc., B.C.S. & PGD-IT**

This page can also be downloaded from our website: [WWW.NAROWALPK.COM/BCSA](http://WWW.NAROWALPK.COM/BCSA)

# Bright Career Science Academy Narowal

**Chapter No. <4> Median:** Line segment joining one vertex of a triangle to the mid point of an opposite side of triangle is called median.

**Isosceles Triangle:** A triangle having two sides are equal is called isosceles triangle.

**Equilateral Triangle:** A triangle having all sides are equal is called equilateral triangle.

**Collinear Points:** Points lying on same line are called collinear points.

**Trapezium:** A quadrilateral having two parallel sides and two non parallel sides is called trapezium.

**Inclination Of A Line:** The angle made by a line with positive x-axis in anti clock wise direction is called inclination of line.

**Declination Of A Line:** The angle made by a line with positive x-axis in clock wise direction is called declination of line.

**Slope or Gradient:** The measure of steepness (  $\text{تھلوان}$  ) is called slope or gradient.

**Centroid:** The point of concurrency of medians is called centroid.

**Ortho Centre:** The point of concurrency of altitudes of the triangle is called ortho centre.

**Circum Centre:** The point of concurrency of right bisectors of the triangle is called circum centre.

B @ S A

**Chapter No. <5> Problem Constraint:** Each linear inequality that related to certain problem of everyday life is called problem constraint.

**Decision Variable:** The variable used in system of linear inequalities relating with the problem are called decision variable.

**Feasible Region:** The solution region of an inequality restricted to first quadrant is called feasible region.

**Feasible Solution:** Each point of feasible region is called feasible solution of system of linear inequality.

**Feasible Solution set:** Set of all feasible solution of the system of linear inequality is called feasible solution set.

**Linear Programming:** Mathematical techniques in which we get maximize or minimize value of variables of linear function is called linear programming.

**Objective Function:** A function which is to be maximized or minimized is called objective function.

**Optimal Solution:** The feasible solution which maximizes or minimizes the objective function is called optimal solution.

**Corner Points:** Corner points of solution region are called vertex or corner point.

**Theorem Of Linear Programming:** The theorem of linear programming state that optimal solution of objective function occurs at corner points of feasible region.

**Chapter No. <6> Cone:** A solid figure generated by a straight line passing through a fixed point and revolving about a fixed line is called cone.

**Nappes:** Two parts of cone are called nappes.

**Circle:** "A set of all points in a plane which are equidistant from a fixed point is called circle." The fixed point is called centre and fixed distance is called radius of circle.

**Point Circle:** A circle whose radius is zero is called point circle.

**Parabola:** "A set of all points in a plane which are equidistant from fixed point and fixed line." The fixed point is called focus and fixed line is called directrix of parabola.

**Ellipse:** A set of all points in a plane such that distance of each point from a fixed point bear a constant ratio less then one to the distance from a fixed line.

**Hyperbola:** A set of all points in a plane such that distance of each point from a fixed point bear a constant ratio greater then one to the distance from a fixed line.

**Chapter No. <7> Scalar:** A quantity which has magnitude only is called scalar. E.g. time, speed, area, volume, heat and work.

**Vector:** A quantity which has both magnitude and direction is called vector. E.g. velocity, acceleration, momentum and force.

**Unit Vector:** A vector whose magnitude is one is called unit vector.

**Null or Zero Vector:** A vector whose magnitude is zero is called null or zero vector.

**Position Vector:** A vector whose initial point is at origin "O" and terminal point is at point "P" is called position vector of point "P".

**Coplanar Vectors:** The vectors lying in the same plane are called the coplanar vectors.

**Parallel Vectors:** Two vectors  $\vec{a}$  and  $\vec{b}$  are said to be parallel if  $\vec{a}=k\vec{b}$  or  $\vec{b}=k\vec{a}$  where  $k$  is any scalar number.

**Perpendicular or Orthogonal Vectors:** Two vectors  $\vec{a}$  and  $\vec{b}$  are said to be Perpendicular if  $\vec{a}.\vec{b}=0$ .

**State Parallelogram Law Of Vector Addition:** The resultant of two vectors acting along the sides of parallelogram is the diagonal of the parallelogram.

**Compiled By: Muzzammil Subhan**

M.Phil. Math (M.U. L.), M.Sc. Math (Q.A.U. Islamabad), M.Ed., B.Sc., B.C.S. & PGD-IT

This page can also be downloaded from our website: [WWW.NAROWALPK.COM/BCSA](http://WWW.NAROWALPK.COM/BCSA)

Contact No: 0300-7779500

Website: [www.narowalpk.com](http://www.narowalpk.com)

Email: [info@narowalpk.com](mailto:info@narowalpk.com)