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<u>Partial differential equation:-</u>

A partial differential equation is a mathematical equation that involves two or more independent variables, an unknown function like dependent on those variables , and partial derivatives of the unknown function with respect to the independent variables. The order of a partial differential equation is the order of the highest derivative involved. A particular solution to a partial differential equation is a function that solves the equation or, in other words, turns it into an identity when substituted into the equation. A solution is called general if it contains all particular solutions of the equation concerned.

The term exact solution is often used for second and higher order nonlinear PDEs to denote a particular solution (see also Preliminary remarks at Second-Order Partial Differential Equations) .Partial differential equations are used to mathematically formulate, and thus aid the solution of, physical and other problems involving functions of several variables, such as the propagation of heat or sound, fluid flow, elasticity, electrostatics, electrodynamics, etc.

<u>Application of Partial differential equation:-</u>

Application Partial Differential Equations The heat equation is an important partial differential equation which describes the distribution of heat (or variation in temperature) in a given region over time. The equation in one spatial dimension can be stated as follows where u(x,t) describes the temperature at a given location x and time t, and k is the thermal diffusivity. Consider the following problem: A one-dimensional bar of length lm has a uniform initial temperature. However, cooling devices are located at each end of the bar that prescribe a temperature of 0 degreee C. The temperature at any location and time, u(x. t) satisfies (1) with the boundary conditions u(0,<) = 0 and u(l,t) = 0. Verify that u(x,t) = 40/npi(1 - (-l)n)e-kn2pi2t,sin(npix) is a solution to the heat equation, = k , with the following prescribed boundary conditions: u(0, t) = 0 Prescribed temperature of 0 degree C at x = 0 u(l, t) = 0 Prescribed temperature of 0 degree C at. x = 1