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Submitted to Miss Shomila

Q : Application of partial Differential Equation.

- What is partial differential equation with example?

1. In mathematics, a partial differential equation (PDE) is a differential equation that contains unknown multivariable functions and their partial derivatives. ... A special case is ordinary differential equations (ODEs), which deal with functions of a single variable and their derivatives.

APPLICATIONS

1. DAILY LIFE

The use of Partial Derivatives in real world is very common. Partial Derivatives are used in basic laws of Physics for example Newton's Law of Linear Motion, Maxwell's equations of Electromagnetism and Einstein's equation in General Relativity.

2. In Computer science

Numerical solutions and simulations. One reason computers are so useful is that they solve problems that do not have an analytical solution or where it is difficult to find one. The world around us is governed by differential equations, so any scientific computing will generally rely on a differential equation and its numerical solution. For example, take the Lorenz or Duffing differential equations. Neither one has an analytical solution. However, using a basic Euler numerical integration method, a solution accurate to the order of the time step used can be obtained. Further, consider any car, train, or plane you have ever rode in. Engineers designed it using finite element analysis (FEA) to make sure it can handle stresses encountered in even extreme use-cases. FEA is essentially utilizing a computer to model the stresses by solving a partial differential equation across a body numerically, and is now extensively used in other multi-physics problems.

3. In Civil Engineering

Any work revolved around modeling structures, fluids, pollutants and more can be modeled using differential equations. If you have any complicated geometries, which most realistic problems have, you'll likely have to use the said differential equations in an approximation framework like that of Finite {Difference, Volume, Element} to approximately figure out a solution to a problem you care about.

These differential equations have huge practical use.. Want to understand structural properties of a bridge or building?

The Partial Differential Equation corresponding to Linear elasticity is probably a good first model to apply. Want to see how fluid causes some pollutant or solvent to advect and diffuse within some soil? You may use a simple advection-diffusion model, Navier-Stokes, or some more specialized differential equation model in the literature.

4. In Electrical engineering

Electrical models of linear partial differential equations may serve several practical purposes:

1. If the networks are physically constructed, they actually may solve the equations within an accuracy of, say, one to five per cent, which is acceptable in many engineering applications.