
# PARTIAL DIFFERENTIAL EQUATIONS

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# PARTIAL DIFFERENTIAL EQUATIONS

## Basic Concepts and Definitions

A differential equation which involves partial derivatives is a called partial differential equation.

For example:

$$x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}=z.....(1)$$

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0.....(2)$$

$$\frac{\partial^2 u}{\partial x\partial y}=\left(\frac{\partial u}{\partial y}\right)^3.....(3)$$

The ***order of a PDE*** is the order of the highest derivative appearing in the equation.

Example: Equation (1) is of first order, (2) and (3) are second order.

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The ***degree of a PDE*** is the positive integral power to which the highest – order derivative (present in the equation) is raised.

Example: Degree of all the above equations (1), (2) and (3) are one.

Few more examples: $yz\frac{\partial z}{\partial x}+zx\frac{\partial z}{\partial y}=xy$ (first order; first degree)

$$\left(\frac{\partial z}{\partial x}\right)^2=z\left(\frac{\partial z}{\partial x}\right)$$ (first order ; second degree)

$$\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2}=0$$ (second order; first degree)

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If $z$ is a function of two independent variable variables $x$ and $y$, then we shall use the following notation for the partial derivatives of $z$ :

$$\frac{\partial z}{\partial x} = P; \frac{\partial z}{\partial y} = q; \frac{\partial^2 z}{\partial x^2} = r; \frac{\partial^2 z}{\partial x \partial y} = s; \frac{\partial^2 z}{\partial y^2} = t$$


# THANK YOU

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