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1. Introduction (differential equation)

- A great many applied problems involve rates, that is, derivatives. An equation containing derivatives is called a differential equation.
- If it contains partial derivatives, it is called a partial differential equation; otherwise it is called an ordinary differential equation.

ex 1) Newton's equation

$$\mathbf{F} = m\mathbf{a} = m\frac{d\mathbf{v}}{dt} = m\frac{d^2\mathbf{r}}{dt^2}$$

ex 2) Heat transfer

$$\frac{dQ}{dt} = kA\frac{dT}{dx}$$

ex 3) RLC circuit

$$L\frac{dI}{dt} + RI + \frac{q}{C} = V \rightarrow L\frac{d^2I}{dt^2} + R\frac{dI}{dt} + \frac{I}{C} = \frac{dV}{dt}$$

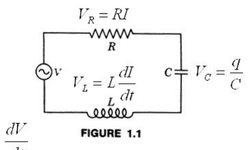

FIGURE 1.1