

Examples of Diff. Equations.

ODE

$$1) \frac{dv}{dt} = 9.8 - \frac{1}{5}v(t)$$

$$2) \frac{dy}{dt} = \sin t - \frac{1}{2}y(t)$$

$$3) \frac{dy}{dt} = ty - t + 2$$

$$4) \frac{dy}{dx} = \frac{x^2}{1-y^2}$$

$$5) \frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 2y(t) = 0$$

PDE

$$1) \frac{\partial u}{\partial t} = \kappa \frac{\partial^2 u}{\partial x^2}$$

$$2) \frac{\partial^2 w}{\partial t^2} = C^2 \left(\frac{\partial^2 w}{\partial x^2} + \frac{\partial^2 w}{\partial y^2} \right)$$

$$3) \frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} = \sigma \frac{\partial^2 u}{\partial x^2}$$

ODE.

$$6) m \frac{d^2 u}{dt^2} = -ku - r \frac{du}{dt} + F_0 \cos \omega t$$

$$7) \frac{d^2 u}{dt^2} + \frac{1}{5} \frac{du}{dt} + u + \frac{1}{5} u^3 = \cos \omega t$$

$$8) \begin{cases} \frac{dx}{dt}(t) = ax(t) - d x(t)y(t) \\ \frac{dy}{dt}(t) = -cy(t) + r x(t)y(t) \end{cases}$$

PDE

$$\begin{cases} \nabla \cdot \vec{u} = 0 \quad \text{or} \quad \frac{\partial u_1}{\partial x} + \frac{\partial u_2}{\partial y} + \frac{\partial u_3}{\partial z} = 0 \\ \vec{u} \cdot \nabla \vec{u} = -\frac{1}{\rho} \nabla p \quad \text{or} \end{cases}$$

$$x\text{-comp.} : u_1 \frac{\partial u_1}{\partial x} + u_2 \frac{\partial u_1}{\partial y} + u_3 \frac{\partial u_1}{\partial z} = -\frac{1}{\rho} \frac{\partial p}{\partial x}$$