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 - ...etc...
 - ...etc...

Shock capturing of Finite Volume

$$\int_{\Omega} \frac{\partial p}{\partial t} + \nabla \cdot F(p) = 0$$

differential form

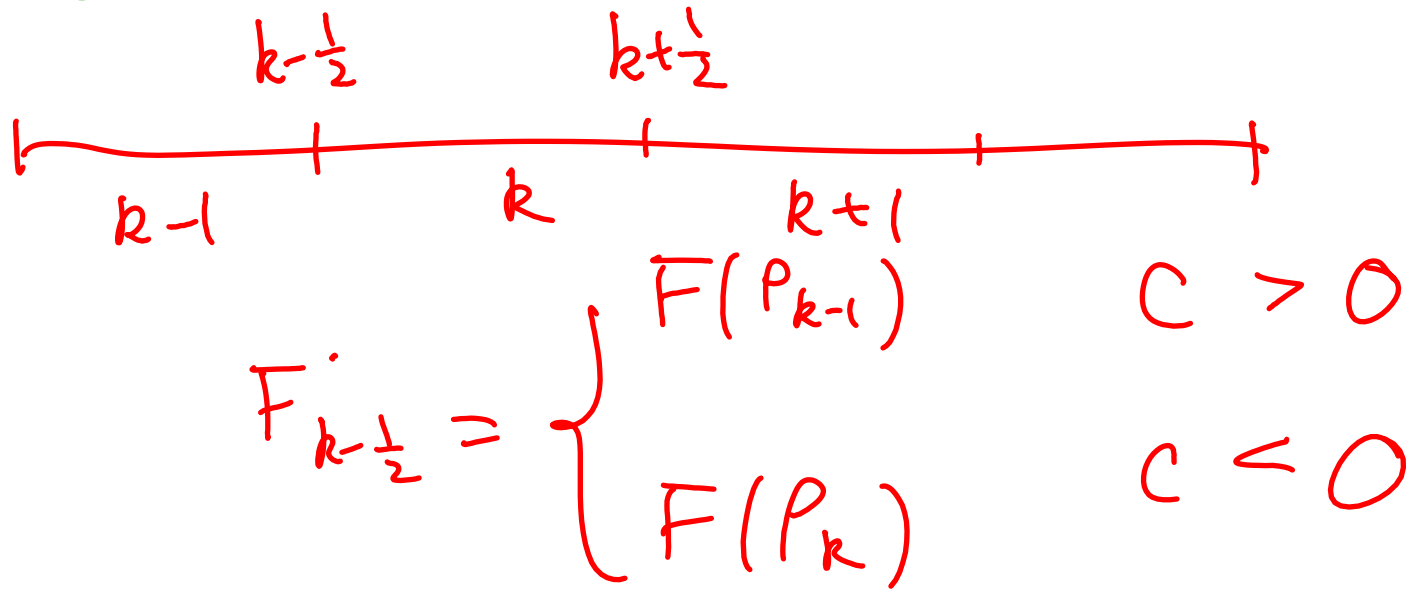
$$\frac{\partial p}{\partial t} + \frac{\partial \bar{F}(p)}{\partial x} = 0$$

$$\frac{d}{dt} \int_{\Omega} p \, dx + \int_{\partial \Omega} \vec{n} \cdot F(p) = 0$$

integral form

$$\frac{d}{dt} \int_L^R p \, dx + F(p)|_R - F(p)|_L = 0$$

Upwind Scheme for finite volume



$$C: \quad \frac{\partial p}{\partial t} + C \frac{\partial p}{\partial x} = 0$$

$$C = \frac{dF}{dp} \quad \frac{\partial p}{\partial t} + \frac{\partial F(p)}{\partial x} = 0$$

Why Upwind Scheme?

Traffic jam simulation

$$\rho(x, t)$$

$$\rho = 0 \quad \text{empty}$$

$$\rho = 1 \quad \longrightarrow$$

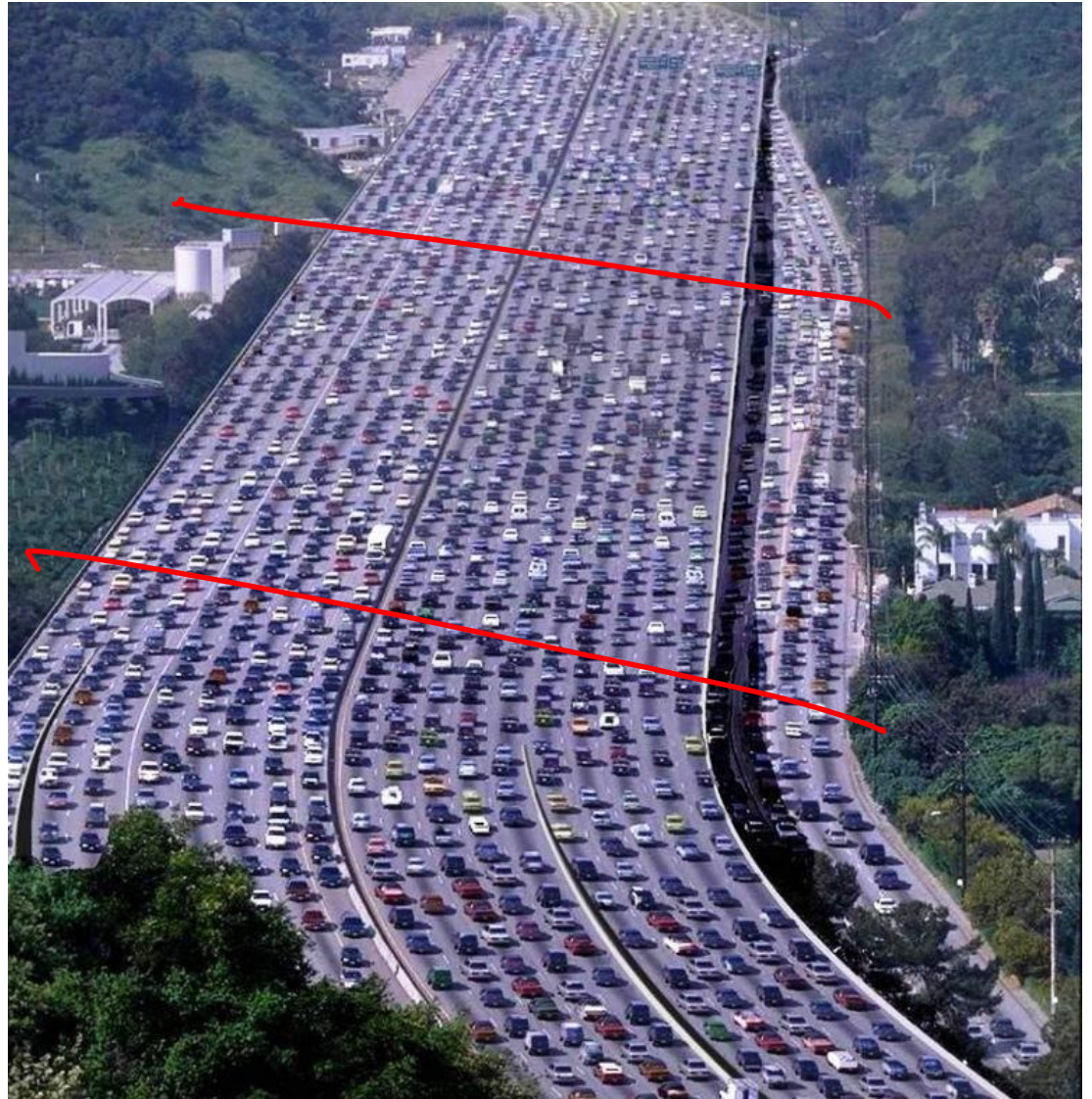
$$u(\rho) = 0 \quad \longrightarrow$$

$$u(\rho) = 1 : 85 \text{ mph}$$

$$u(\rho) = 1 - \rho$$

What's $F(\rho)$

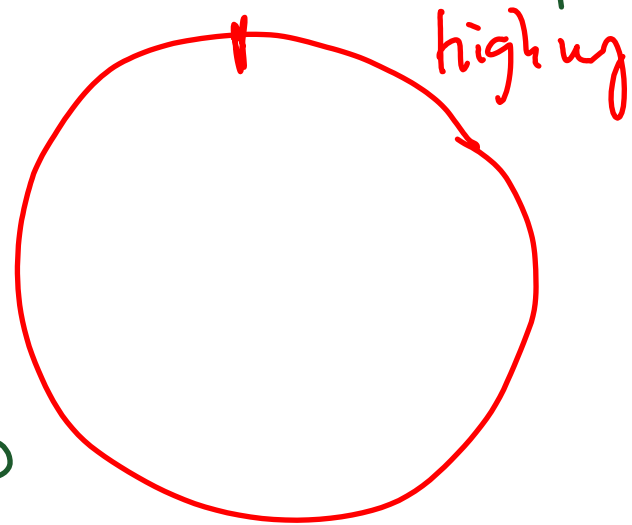
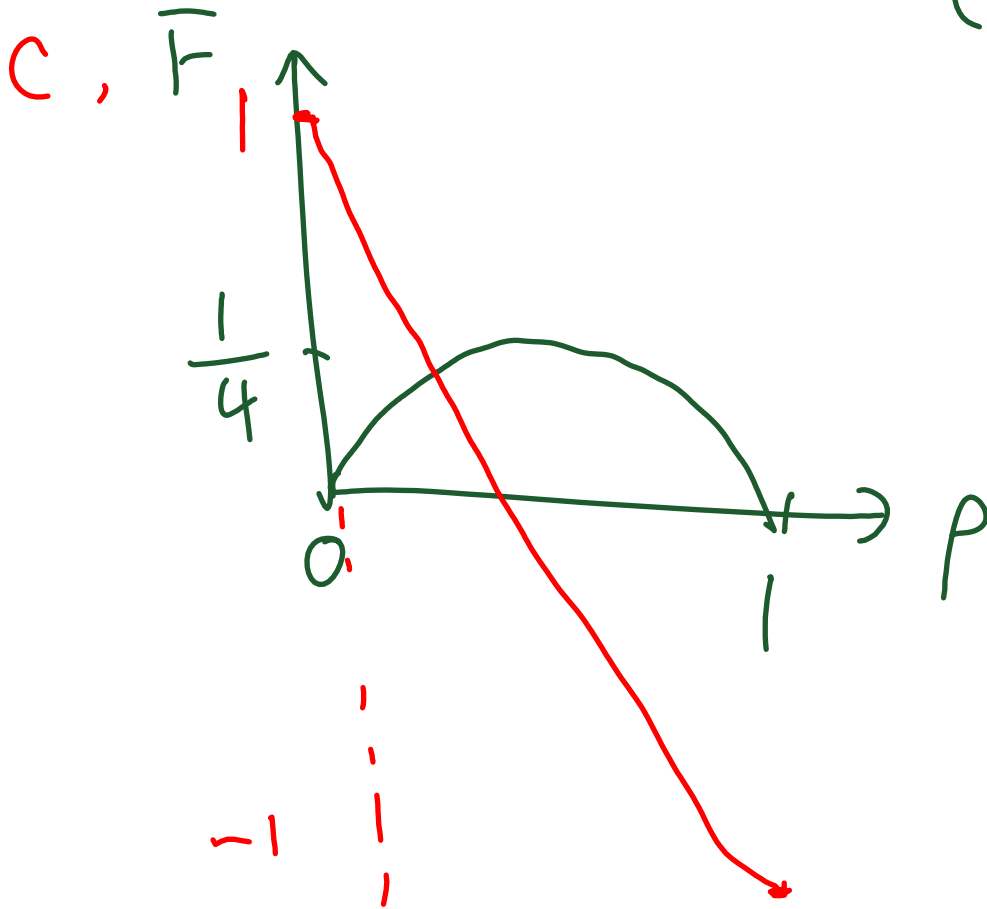
$$= \rho \cdot u = \rho - \rho^2$$



$$\frac{\partial P}{\partial t} + \frac{\partial F(P)}{\partial X} = 0$$

where $F(P) = P - P^2$

$$C = 1 - 2P = \frac{dF}{dP}$$



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