

## جلسه نهم

## تحلیل تانسوری و برداری

توابع اسکالر:

$$T = T(t), \rho = \rho(t)$$

$$\vec{V} = \vec{V}(t)$$

$$\vec{Q} = \vec{Q}(t)$$

مشتق توابع اسکالر

$$T = T(t) \rightarrow \dot{T} = \lim_{\Delta t \rightarrow 0} \frac{T(t + \Delta t) - T(t)}{\Delta t}$$

$$\vec{V} = \vec{V}(t) \rightarrow \vec{a} = \dot{\vec{V}} = \lim_{\Delta t \rightarrow 0} \frac{\vec{V}(t + \Delta t) - \vec{V}(t)}{\Delta t}$$

$$\vec{V} = V_i(t)\vec{e}_i \rightarrow \vec{a} = \dot{\vec{V}} = \dot{V}_i(t)\vec{e}_i$$

$$\vec{T} = \vec{T}(t) \rightarrow \dot{\vec{T}} = \lim_{\Delta t \rightarrow 0} \frac{\vec{T}(t + \Delta t) - \vec{T}(t)}{\Delta t}$$

$$\vec{T} = T_{ij}(t)\vec{e}_i \otimes \vec{e}_j \rightarrow \dot{\vec{T}} = \dot{T}_{ij}(t)\vec{e}_i \otimes \vec{e}_j$$

$$\frac{d}{dt}(\alpha(t)\vec{T}(t)) = \dot{\alpha}(t)\vec{T}(t) + \alpha(t)\dot{\vec{T}}(t)$$

$$\frac{d}{dt}(\vec{T} + \vec{S}) = \dot{\vec{T}} + \dot{\vec{S}}$$

$$\frac{d}{dt}(\vec{T}(t)\vec{a}(t)) = \dot{\vec{T}}(t)\vec{a}(t) + \vec{T}(t)\dot{\vec{a}}(t)$$

$$\frac{d}{dt}(\vec{T}(t)\vec{S}(t)) = \dot{\vec{T}}(t)\vec{S}(t) + \vec{T}(t)\dot{\vec{S}}(t)$$

$$\frac{d}{dt}(\vec{T}^T) = \left( \frac{d}{dt}(\vec{T}) \right)^T$$