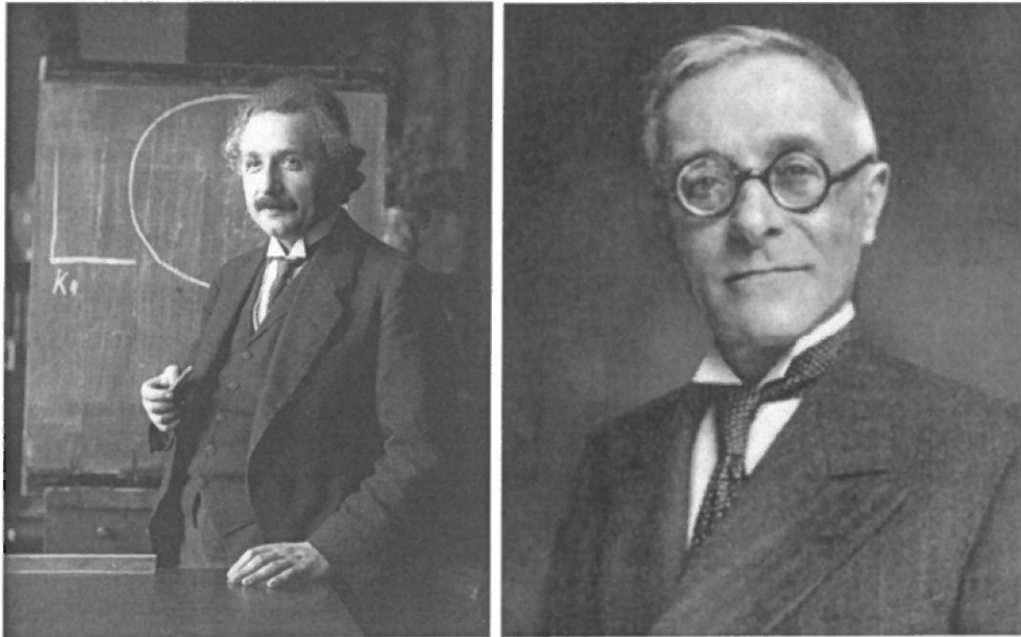


Einstein Convention

Homework – January 23, 2013



Einstein (left), Levi-Civita (right).

When asked what he liked best about Italy, Einstein said “Spaghetti and Levi-Civita”

Einstein was a lazy person, so he got quickly tired of writing all these sums we have seen and invented the convention (known as Einstein convention): **Two identical indices are automatically summed.**

Sometimes (but not always) one indicates indices, which one sums in the next step by **contractions**, i.e., connects them by a lines. Examples:

$$\underbrace{\epsilon_{ijk}\epsilon_{ilm}} = \delta_{jl}\delta_{km} - \delta_{jm}\delta_{kl}$$

$$\delta_{ij} \underbrace{x_i y_j} = \underbrace{x_i y_i} = \vec{x} \cdot \vec{y}$$

$$\underbrace{\delta_{ij} x_i y_j} = \underbrace{x_j y_j} = \vec{x} \cdot \vec{y}$$

Homework:

Re-write homeworks 2 and 3 using the Einstein convention and draw the contractions.