# Aufgabe 3) Affiner Zusammenhang

$$\Gamma'^{\mu}_{\nu\sigma} = \frac{\partial x'^{\mu}}{\partial \xi^{\varrho}} \frac{\partial^2 \xi^{\varrho}}{\partial x'^{\nu} \partial x'^{\sigma}} \checkmark$$

$$= \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\alpha}}{\partial \xi^{\varrho}} \frac{\partial^2 \xi^{\varrho}}{\partial x'^{\nu} \partial x'^{\sigma}} \checkmark$$

$$= \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\alpha}}{\partial \xi^{\varrho}} \frac{\partial}{\partial x'^{\nu}} \left( \frac{\partial \xi^{\varrho}}{\partial x'^{\sigma}} \right) \checkmark$$

$$= \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\alpha}}{\partial \xi^{\varrho}} \frac{\partial}{\partial x'^{\nu}} \left( \frac{\partial \xi^{\varrho}}{\partial x^{\beta}} \frac{\partial x^{\beta}}{\partial x'^{\sigma}} \right) \checkmark$$

$$= \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\alpha}}{\partial \xi^{\varrho}} \left( \frac{\partial^2 \xi^{\varrho}}{\partial x'^{\nu} \partial x^{\beta}} \frac{\partial x^{\beta}}{\partial x'^{\sigma}} + \frac{\partial \xi^{\varrho}}{\partial x^{\beta}} \frac{\partial^2 x^{\beta}}{\partial x'^{\nu} \partial x'^{\sigma}} \right) \checkmark$$

$$= \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\alpha}}{\partial \xi^{\varrho}} \left( \frac{\partial^2 \xi^{\varrho}}{\partial x^{\gamma} \partial x^{\beta}} \frac{\partial x^{\gamma}}{\partial x'^{\nu}} \frac{\partial x^{\beta}}{\partial x'^{\sigma}} + \frac{\partial \xi^{\varrho}}{\partial x^{\beta}} \frac{\partial^2 x^{\beta}}{\partial x'^{\nu} \partial x'^{\sigma}} \right) \checkmark$$

$$= \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\gamma}}{\partial x'^{\nu}} \frac{\partial x^{\beta}}{\partial x'^{\sigma}} \Gamma^{\alpha}_{\beta\gamma} + \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\alpha}}{\partial \xi^{\varrho}} \frac{\partial \xi^{\varrho}}{\partial x^{\beta}} \frac{\partial^2 x^{\beta}}{\partial x'^{\nu} \partial x'^{\sigma}} \checkmark$$

$$= \frac{\partial x'^{\mu}}{\partial x^{\alpha}} \frac{\partial x^{\gamma}}{\partial x'^{\nu}} \frac{\partial x^{\beta}}{\partial x'^{\sigma}} \Gamma^{\alpha}_{\beta\gamma} + \frac{\partial x'^{\mu}}{\partial x^{\beta}} \frac{\partial^2 x^{\beta}}{\partial x'^{\nu} \partial x'^{\sigma}} \checkmark$$

3/3