Continuum mechanics

5. exercise – stress

1. (Holzapfel, Problem 1 page 128)
   Consider an infinitesimal resultant (pseudo)force \( df_B = (T_B N) dA \), where \( T_B N \) is the Biot traction vector. Verify that
   \[
   df_B = R^T df.
   \]
   Hint. Use the results \( T_B = R^T P \), \( T = PN \) and \( df =TdA \).

2. The lower endpoint B of a bar shown in the figure below displaces downwards by an amount \( u \). Determine the equilibrium equations of the point \( \hat{B} \) by using
   (a) the Cauchy stress components \( \sigma_{ij} \),
   (b) the first Piola-Kirchhoff stress components \( P_{iJ} \) and
   (c) the second Piola-Kirchhoff stress components \( S_{IJ} \).