

Special and General Relativity (PHZ 4601/5606) Fall 2017 Solutions

Set 6

18. Raising and lowering; contractions.

(a) Circle the correct equations in the following.

$$T^{11} = +T_{11} ,$$

$$T^{12} = +T_{12} ,$$

$$T^{13} = +T_{13} ,$$

$$T^{14} = -T_{14} ,$$

$$T^{41} = -T_{41} ,$$

$$T^{42} = -T_{42} ,$$

$$T^{43} = -T_{43} ,$$

$$T^{44} = +T_{44}$$

(b) $T^{\alpha\beta} T_{\alpha\beta} =$

$$\begin{aligned} &+ T^{11} T_{11} + T^{12} T_{12} + T^{13} T_{13} + T^{14} T_{14} \\ &+ T^{21} T_{21} + T^{22} T_{22} + T^{23} T_{23} + T^{24} T_{24} \\ &+ T^{31} T_{31} + T^{32} T_{32} + T^{33} T_{33} + T^{34} T_{34} \\ &+ T^{41} T_{41} + T^{42} T_{42} + T^{43} T_{43} + T^{44} T_{44} . \end{aligned}$$