442 Tutorial Sheet 1[1]

28 October 2004

1. (1) Show that $T^{ab}S_b$ is a tensor, where T and S are tensors.

2. (1) Show that $T^{(ab)}V_{[a|c|b]}$ vanishes, where T and V are tensors.

3. (1) Show that $T^{ab}{}_e = T^{abc}{}_{de}\delta^d_c$ is a tensor.

4. (1) Show that $T^{ab} = -T^{ba}$ in one coördinate system implies that $T^{a'b'} = -T^{b'a'}$ in another coördinate system.

5. (2) Write $\triangle f$ in polar coordinates.

6. (3) Show that torsion is a tensor.

7. (3) Find the transformation law for $\det g_{ab}$.

8. (2) Show that $D_a g^{bc} = 0$ for a torsion free metric connection.