1. Expand out the expression for the parallel transport matrix U and show that to second order in the size (typical width) of the loop, for a closed path,

$$U^{\alpha}{}_{\beta} = \delta^{\alpha}_{\beta} - \frac{1}{2} R^{\alpha}{}_{\beta\mu\nu} \mathcal{M}^{\mu\nu} + \ldots$$

where

$$\mathcal{M}^{\mu\nu} = \oint x^{\mu} dx^{\nu}.$$

Show that $\mathcal{M}^{\mu\nu}$ is antisymmetric. If the path is around a small parallelogram with sides given by tangent vectors A and B, show that $\mathcal{M}^{\mu\nu} = A^{\mu} B^{\nu} - A^{\nu} B^{\mu}$.