ASTR 680 Practice questions for lecture 6: Tensor manipulations

1. Using the metric tensor to raise or lower indices, show that $v_\alpha v^\alpha = v^\beta v_\beta$ for any **v**.

2. Suppose that we have a test particle of nonzero rest mass in a circular orbit of circumferential radius r around a mass M with an exterior spacetime that is Schwarzschild. Show that u_ϕ is indeed the correct expression for the specific angular momentum (i.e., the angular momentum per unit mass of the test particle).