

INTRODUCTION TO GENERAL RELATIVITY AND GRAVITATION

HOMEWORK 7 - 2025

Exercise 1.

Show that the gauge defined by equation (9) from Lesson notes 7 gives to first order equation (12).

Exercise 2.

Show that in the slow motion approximation Einstein's equations become (37) in Lesson notes 7.

Exercise 3.

Show that the Weyl tensor satisfies equations (45) in Lesson notes 7.

Exercise 4.

Show that the Weyl tensor is trace free.

Exercise 5.

Show that two conformally related metrics have the same Weyl tensor.

Exercise 6.

Show that for the metric

$$g_{\mu\nu} = e^{2\phi}\eta_{\mu\nu} \tag{1}$$

the Ricci scalar satisfies equation (52) from Lesson notes 7.