

# Sign conventions

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The authoritative book by Misner, Thorne and Wheeler (MTW) [1] is often used as a reference in GR. MTW analyzed the different sign conventions used by different authors and came up with a “sign convention scheme”, which is defined by the following equations

$$\eta_{\mu\nu} = [S1] \times \text{diag}(-1, +1, +1, +1) \quad (1)$$

$$R^\mu_{\alpha\beta\gamma} = [S2] \times \left( \partial_\beta \Gamma^\mu_{\alpha\gamma} - \partial_\gamma \Gamma^\mu_{\alpha\beta} + \Gamma^\mu_{\beta\sigma} \Gamma^\sigma_{\alpha\gamma} - \Gamma^\mu_{\gamma\sigma} \Gamma^\sigma_{\alpha\beta} \right) \quad (2)$$

$$G_{\mu\nu} = [S3] \times \kappa T_{\mu\nu} \quad (3)$$

where the Einstein gravitational constant is defined as

$$\kappa = \frac{8\pi G}{c^4} \approx 2.0766 \times 10^{-43} \text{N}^{-1} \quad (4)$$

Sign [S3] sets the condition on the kind of contraction of the Riemann tensor that we adopt for the definition of the Ricci tensor.

In this course I adopt the following convention, [S1] = -1, [S2] = +1, and [S3] = +1. The last choice implies that

$$R_{\mu\nu} = R^\alpha_{\mu\nu\alpha} \quad (5)$$

this is the same as in the book by W. Rindler [2].

## References

- [1] Charles W Misner, Kip S Thorne, and John Archibald Wheeler. *Gravitation*. Macmillan, 1973.
- [2] Wolfgang Rindler. *Essential relativity: special, general, and cosmological*. Springer Science & Business Media, 1977.