Numerical Relativity Cheat Sheet

Equations I should know, but I don't

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1 Conventions

We denote the metric as $g_{\alpha\beta}$.

2 ADM Decomposition

The line element $\mathrm{d}s^2$ is

$$\mathrm{d}s^2 = g_{\alpha\beta}\,\mathrm{d}x^\alpha\,\mathrm{d}x^\beta = -\alpha^2\,\mathrm{d}t^2 + \gamma_{ij}(\mathrm{d}x^i + \beta^i\,\mathrm{d}t)(\mathrm{d}x^j + \beta^j\,\mathrm{d}t) \tag{1}$$

$$n^\alpha = \frac{1}{\alpha}(1, -\beta^i) \tag{2}$$

$$n_\alpha = (-\alpha, 0, 0, 0) \tag{3}$$

3 Useful identities

$$\sqrt{-g} = \alpha\sqrt{\gamma} \tag{4}$$