Preliminaries

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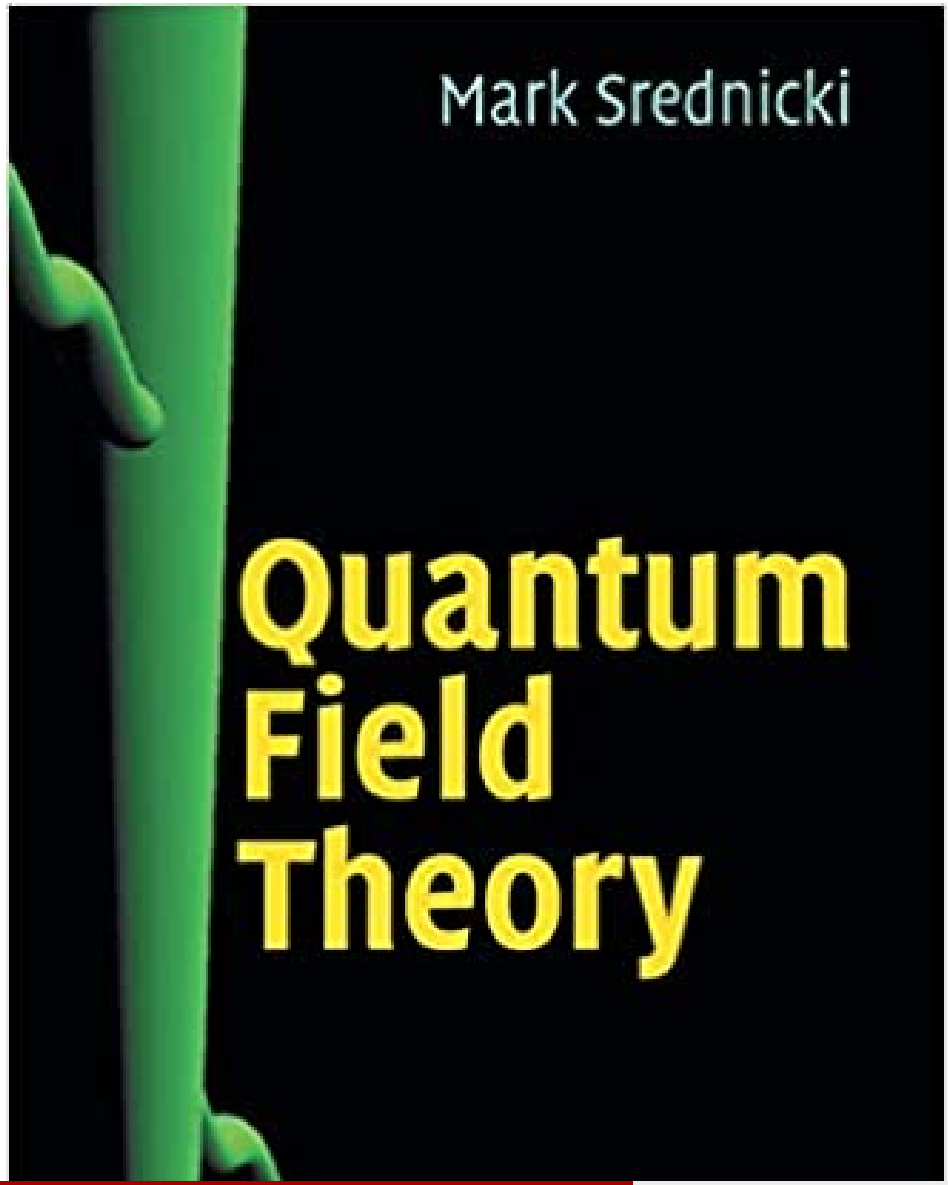
Textbook



- The course will loosely be based on Srednicki's textbook
- I may deviate quite a bit

Notation (1/3)

- Natural units:

$$c = \hbar = k_B = 1\,. \tag{1.1}$$

- 3-vectors (Latin indices) and 4-vectors (Greek indices)

$$A^i = \begin{pmatrix} A^1 \\ A^2 \\ A^3 \end{pmatrix}\,, \quad A^\mu = \begin{pmatrix} A^0 \\ A^1 \\ A^2 \\ A^3 \end{pmatrix}\,. \tag{1.2}$$

- Einstein's sum convention in 3+1 dimensions:

$$A_\mu A^\mu = \; = A^\mu g_{\mu\nu} A^\nu = A_0 A^0 + A_1 A^1 + A_2 A^2 + A_3 A^3 \tag{1.3}$$

- Derivatives:

$$\nabla^2 \equiv \partial_i \partial_i\,, \quad \partial_x \equiv \frac{\partial}{\partial x}\,. \tag{1.4}$$

Notation (2/3)

- Metric Tensor $g_{\mu\nu}$
- (Mainly:) Minkowski space-time
- Sign Convention: mostly positive

$$g_{\mu\nu} \equiv \begin{pmatrix} -1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \tag{1.5}$$

- Note: occasionally I might change number of dimensions, discuss non-constant $g_{\mu\nu}$ and/or change the sign convention. I will clearly label these exceptions!!!

Notation (3/3)

- Integrals without any limits are taken to be improper integrals:

$$\int dx = \int_{-\infty}^{\infty} dx \tag{1.6}$$

- Sums are treated similarly:

$$\sum_n a_n = \sum_{n=-\infty}^{\infty} a_n \,. \tag{1.7}$$