Precision Computations

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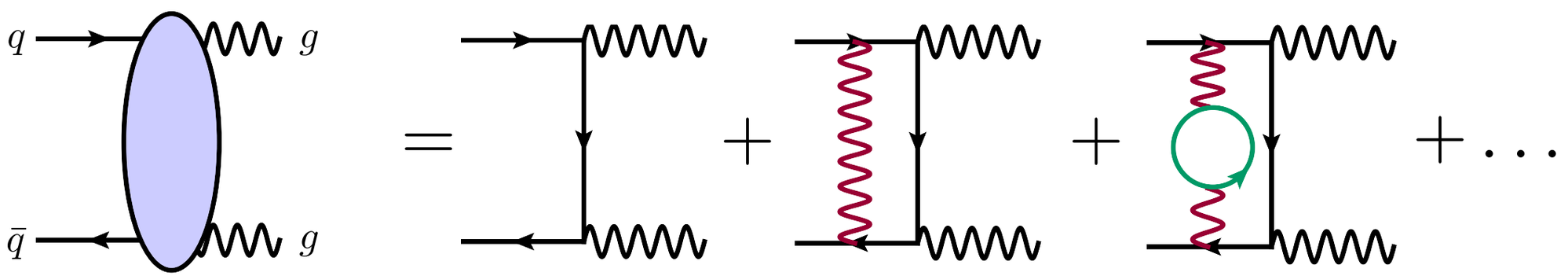
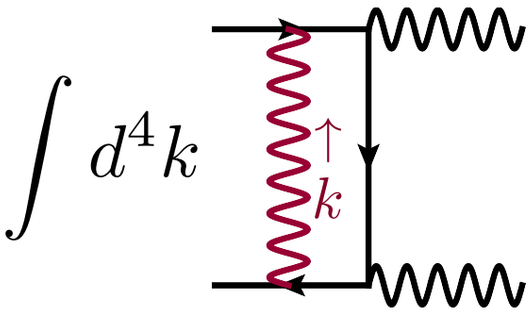
Scattering amplitudes

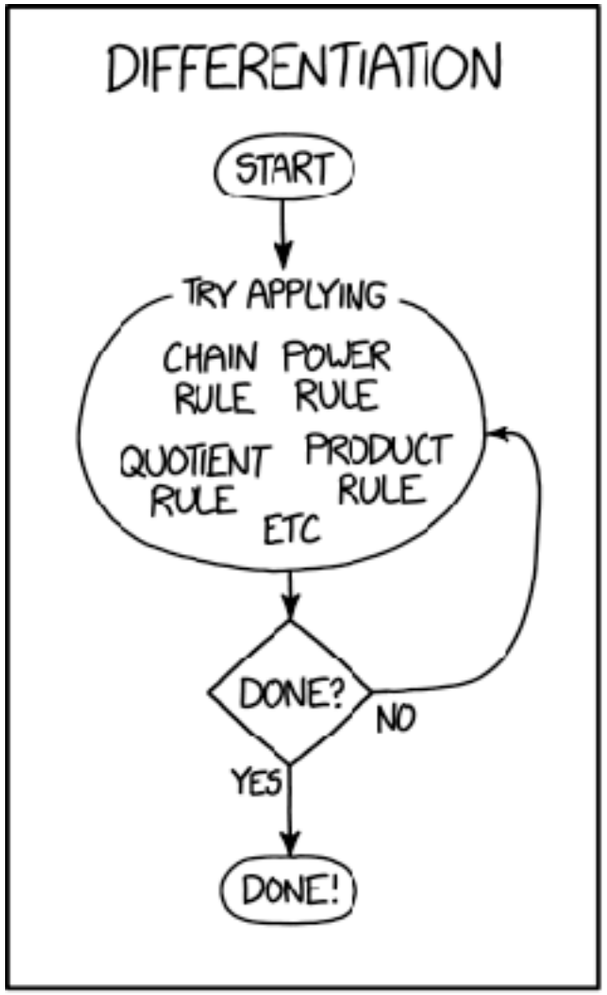
$$\mathcal{A}_N = \mathcal{A}_N^{(0)} + \alpha_s\, \mathcal{A}_N^{(1)} + \alpha_s^2\, \mathcal{A}_N^{(2)} + \ldots \qquad \alpha_s = \text{ coupling constant}$$

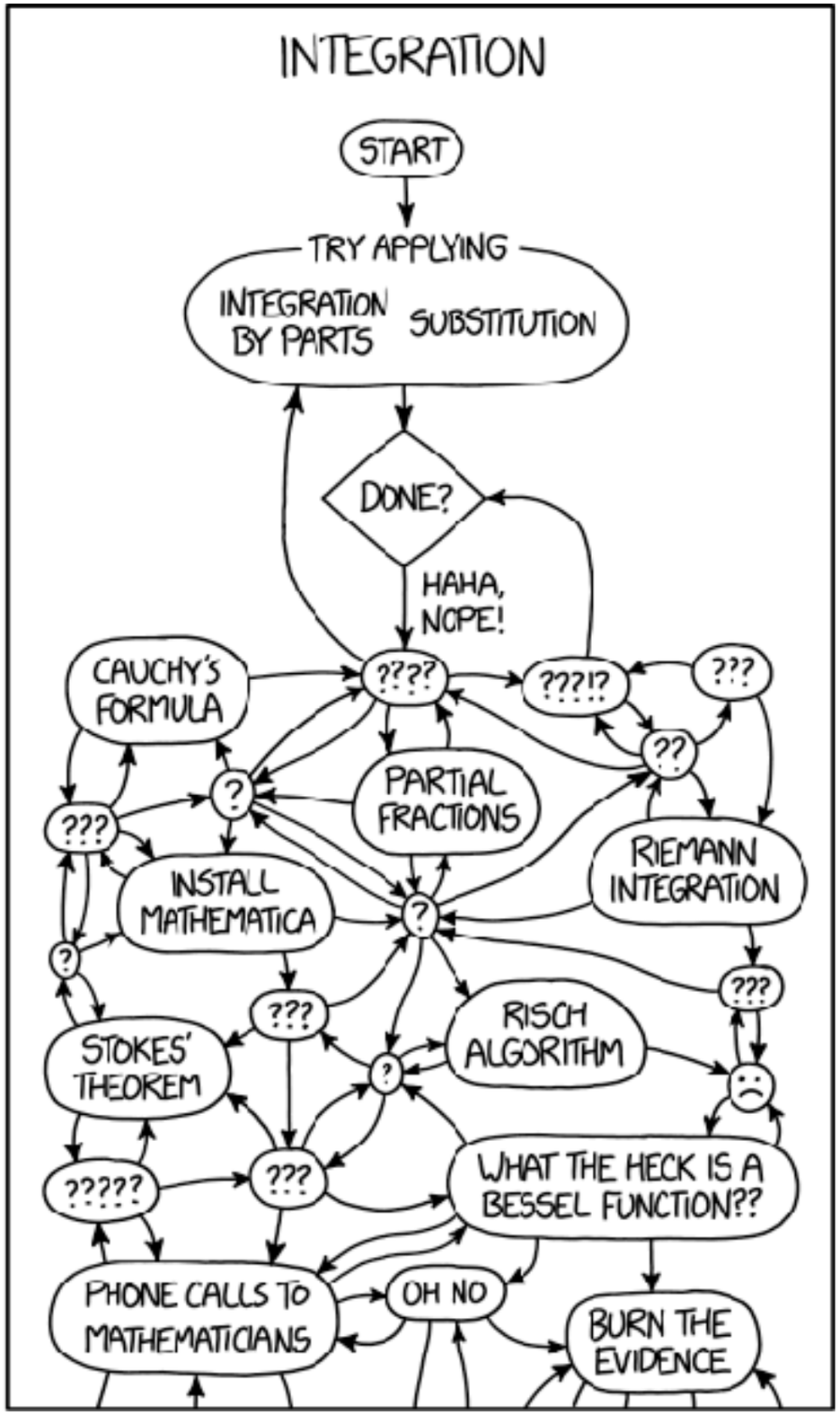
$\mathcal{A}_N^{(L)}$ L



Scattering amplitudes



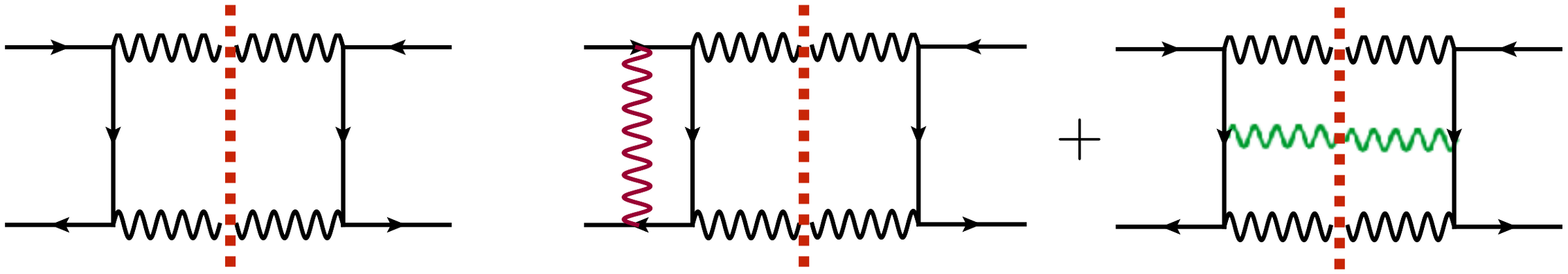


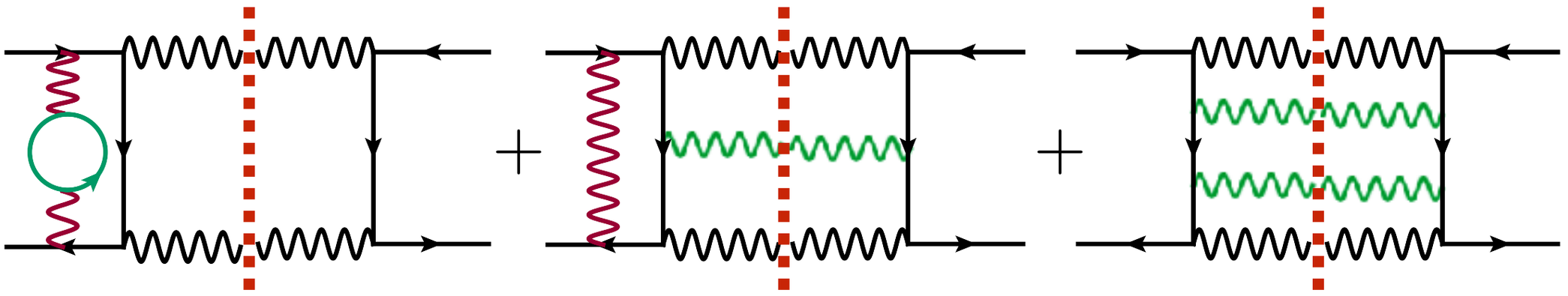


$2 \to 2$ $\quad$ $2 \to 3$

$2 \to 1$ $\quad$ $2 \to 2$

Infrared singularities





Computer algebra

SMEFT

$$\mathcal{L}_{\rm QCD,6} = \mathcal{L}_{\rm QCD} + \frac{c_G^0}{\Lambda^2}\,\mathcal{O}_G + \sum_{i,j=1}^{n_u} \frac{c_{uG}^{0,ij}}{\Lambda^2}\mathcal{O}_{uG}^{ij} + \sum_{i,j=1}^{n_d} \frac{c_{dG}^{0,ij}}{\Lambda^2}\mathcal{O}_{dG}^{ij} + \sum_n \frac{c_{4q_n}^0}{\Lambda^2}\mathcal{O}_{4q_n}$$

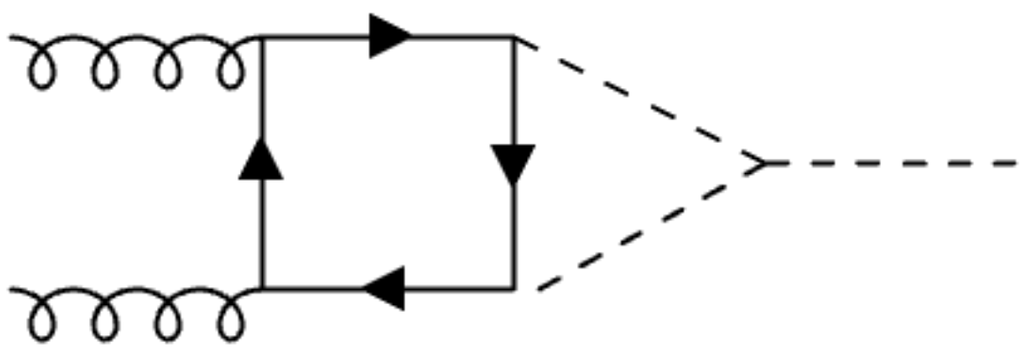
$$\mathcal{O}_G = f^{abc}\, G_\mu^{0a\nu}\, G_\nu^{0b\rho}\, G_\rho^{0c\mu}$$

$$\mathcal{O}_{uG}^{ij} = \frac{iv}{\sqrt{2}}\,\overline{u}_i^0 T^a \tau^{\mu\nu} u_j^0\, G_{\mu\nu}^{0a}$$

$$\mathcal{O}_{dG}^{ij} = \frac{iv}{\sqrt{2}}\,\overline{d}_i^0 T^a \tau^{\mu\nu} d_j^0\, G_{\mu\nu}^{0a}$$

$$\mathcal{O}_{QQ}^{(1)} = \frac{1}{2}(\overline{Q}\gamma^\mu Q)(\overline{Q}\gamma_\mu Q)\,,$$
$$\mathcal{O}_{QQ}^{(8)} = \frac{1}{2}(\overline{Q}\gamma^\mu T^A Q)(\overline{Q}\gamma_\mu T^A Q)\,,$$
$$\mathcal{O}_{Qt}^{(1)} = (\overline{Q}\gamma^\mu Q)(\bar{t}_R\gamma_\mu t_R)\,,$$
$$\mathcal{O}_{Qt}^{(8)} = (\overline{Q}\gamma^\mu T^A Q)(\bar{t}_R\gamma_\mu T^A t_R)\,,$$
$$\mathcal{O}_{Qb}^{(1)} = (\overline{Q}\gamma^\mu Q)(\bar{b}_R\gamma_\mu b_R)\,,$$
$$\mathcal{O}_{Qb}^{(8)} = (\overline{Q}\gamma^\mu T^A Q)(\bar{b}_R\gamma_\mu T^A b_R)\,,$$
$$\mathcal{O}_{tt} = (\bar{t}_R\gamma^\mu t_R)(\bar{t}_R\gamma_\mu t_R)\,,$$
$$\mathcal{O}_{bb} = (\bar{b}_R\gamma^\mu b_R)(\bar{b}_R\gamma_\mu b_R)\,,$$
$$\mathcal{O}_{tb}^{(1)} = (\bar{t}_R\gamma^\mu t_R)(\bar{b}_R\gamma_\mu b_R)\,,$$
$$\mathcal{O}_{tb}^{(8)} = (\bar{t}_R\gamma^\mu T^A t_R)(\bar{b}_R\gamma_\mu T^A b_R)\,,$$
$$\mathcal{O}_{QtQb}^{(1)} = (\overline{Q}^I t_R)\epsilon_{IJ}(\overline{Q}^J b_R) + \text{h.c.}\,,$$
$$\mathcal{O}_{QtQb}^{(8)} = (\overline{Q}^I T^A t_R)\epsilon_{IJ}(\overline{Q}^J T^A b_R) + \text{h.c.}\,,$$

SMEFT



Possible projects