Notes concerning article

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1 Role of γ

1.1 Introduction

μ is the renormalization scale,

$$m_0(\lambda) \equiv m_r(\lambda) Z_m(\epsilon, g_r) \tag{1.1}$$

RG equations

$$-\gamma_m \equiv \frac{\partial \log m_r(\lambda)}{\partial \log \mu} = -\frac{\partial \log Z_m}{\partial \log \mu} = \frac{\partial \log Z_m}{\partial \log \mu_0} \tag{1.2}$$

$$m_0(\lambda) = \lambda m_0, \quad \mu_0(\lambda) = \lambda \mu_0$$

We want to find how $m_r(\lambda)$ transforms. Differentiating equation 1.1

$$\frac{\partial m_0(\lambda)}{\partial \log \lambda} = \frac{\partial}{\partial \log \lambda}(m_r(\lambda) Z_m) = Z_m \frac{\partial m_r(\lambda)}{\partial \log \lambda} + m_r(\lambda) \frac{\partial Z_m}{\partial \log \lambda}$$

$$\frac{1}{Z_m} \frac{\partial m_0(\lambda)}{\partial \log \lambda} = \frac{\partial m_r(\lambda)}{\partial \log \lambda} + \frac{m_r(\lambda)}{Z_m} \frac{\partial Z_m}{\partial \mu_0} \frac{\partial \mu_0}{\partial \log \lambda}$$

$$\frac{\partial m_0(\lambda)}{\partial \log \lambda} = \frac{\partial m_0(\lambda)}{\partial \lambda} \left(\frac{\partial \log \lambda}{\partial \lambda} \right)^{-1} = m_0 \lambda = m_0(\lambda)$$