

$$\frac{\partial}{\partial \theta} \mathbb{E}_{b \sim P} \left[ g_{\theta}(b \sigma_{\theta} + \mu_{\theta}) \right] = \mathbb{E}_{b \sim P} \left[ \frac{\partial}{\partial \theta} g_{\theta}(b \sigma_{\theta} + \mu_{\theta}) \right]$$