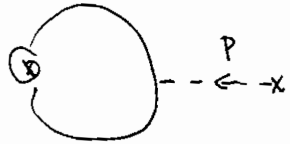

$g\bar{\Psi}(\phi_1 + i\gamma_5 \phi_2)\Psi$

Induced Current Calculation

expand around
$\phi_1 = v$ point
$m = gv$

$$g\int \frac{d^2k}{(2\pi)^2} \frac{\mathrm{tr}\,\gamma_\mu(\not{k}+m)\gamma_5(\not{p}+\not{k}+m)}{(k^2-m^2)((k+p)^2-m^2)}$$

$p \to 0$, leading term, Euclideanize

$$g\int \frac{d^2k}{(2\pi)^2} \frac{m\,\mathrm{tr}\,\gamma_\mu\gamma_5\not{p}}{(k^2+m^2)^2}$$

$\gamma_0 = \sigma_2$, $\gamma_1 = i\sigma_1$, $\gamma_5 = \sigma_3$

from trace
↓

$$2\,\frac{g}{4\pi^2}\,\pi \underbrace{\int_0^\infty \frac{dk^2}{(k^2+m^2)^2}}_{\frac{1}{m^2}}$$

$\epsilon_{\mu\nu}p_\nu$

$\overrightarrow{g/m = 1/|\phi_1|}$ $\quad \frac{1}{2\pi}\,\frac{\epsilon_{\mu\nu}\partial_\nu\phi_2}{\phi_1}$

invariant form: $\frac{1}{2\pi}\,\frac{\epsilon^{ab}\epsilon_{\mu\nu}\phi^a\partial_\nu\phi^b}{|\phi|^2} = \frac{1}{2\pi}\epsilon_{\mu\nu}\partial_\nu\Theta$

$\Theta = \tan^{-1}\phi_1/\phi_2$

for $\phi_1 \to \pm v$ at $\pm\infty$, $\Delta\phi = \pi$

$Q =$ [redacted] $\frac{1}{2}$