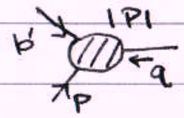
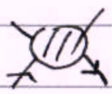
Lecture 17 Outline

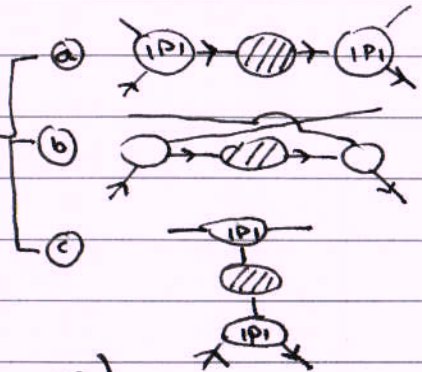
(1) we fixed definition of 'g' $\rightarrow$ fixes 'F'


$\equiv -i\Gamma'(p^2, p'^2, q^2)$

$g \equiv \Gamma'(m^2, m^2, \mu^2) \rightarrow$ only one definition

<u>example</u> $\phi + \psi \rightarrow \phi + \psi$

 $\equiv$  + not 1PI



(a) $i\Gamma'(s, m^2, \mu^2)\ D'(s)\ \left(-i\Gamma'(m^2, s, \mu^2)\right)$

$= \frac{i(-ig)^2}{s-m^2} \rightarrow$ pole at $s = m^2$, residue $\rightarrow g^2$

$+ \cdots$

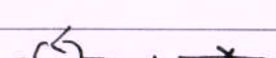
(b) and (c) has pole at $u = m^2$ and $t = m^2$.

(2) Renormalization vs. infinities:

A Lagrangian is renormalizable if all the counterterms required to remove infinites from Green's functions are terms of the same type as those present in the original Lagrangian.

(3) Unstable particles

$D'(k^2) = \frac{i}{k^2 - \mu^2 - \Pi'(k^2) - i\epsilon}$

$\Pi'(k^2)\Big|_{\theta(g^2)} =$ 

$iB_2k^2 - iC_2$

$\Pi_f(\mu^2)$

Can have imaginary part for $\mu^2 > 4m^2$

Prescription: $\mu > 2m$

$\mathrm{Re}\ \Pi'(\mu^2) = 0$

$\mathrm{Re}\ \frac{d\Pi'}{dk^2}\Big|_{k^2=\mu^2} = 0$

$\rightarrow (-iD'(k^2))^{-1} = k^2 - (\mu - i\frac{\Gamma}{2})^2 + \theta(g^4)$