SECTION 7

Slide 9 — Aside on colour factors — ONLY IF TIME

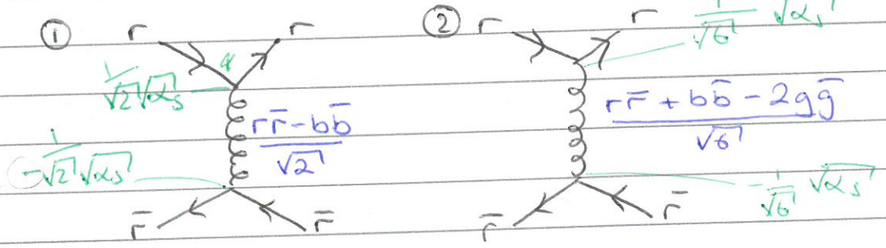
Meson q $\bar{q}$ are in a colourless state

eg $\frac{1}{\sqrt{3}}(r\bar{r} + b\bar{b} + g\bar{g})$

Consider an $r\bar{r}$ pair

Bound by exchange of gluons - 4 possibilities

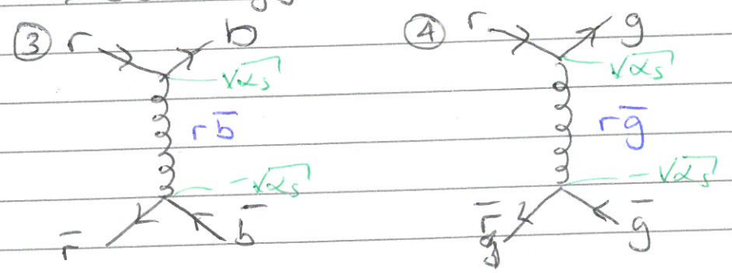
$r\bar{r} \to r\bar{r}$



Couplings diluted by colour factor

$M\alpha -\frac{1}{2}\alpha_s$ $\quad$ $\alpha -\frac{1}{6}\alpha_s$

$r\bar{r} \to b\bar{b}$ or $g\bar{g}$



$M\alpha -\alpha_s$ $\quad$ $\alpha -\alpha_s$

Sum the contributions $M\alpha -\frac{8}{3}\alpha_s$

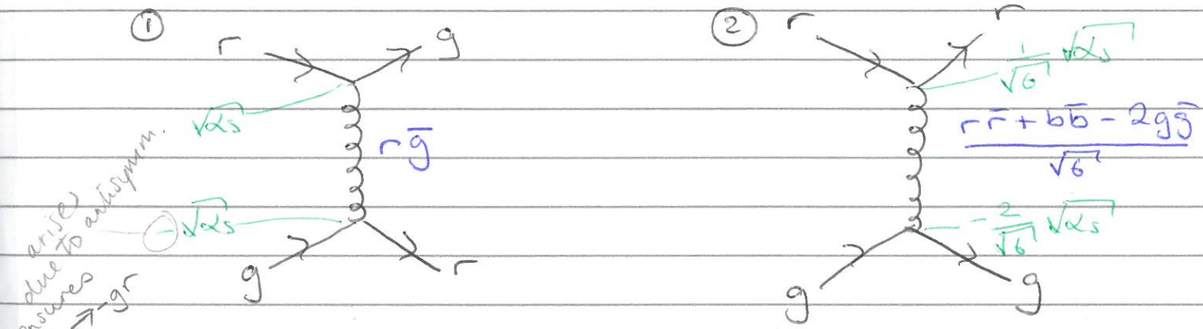
$\Rightarrow V\alpha -\frac{8}{3}\frac{\alpha_s}{r}$

Baryon qq pair in a baryon have totally antisymmetric colour state

eg for rg pair $\frac{rg - gr}{\sqrt{2}}$

Consider an rg pair

Bound by exchange of gluons



$M\alpha -\alpha_s$ $\quad$ $M\alpha \frac{-2}{6}\alpha_s = \frac{-\alpha_s}{3}$

Sum the contributions $M\alpha -\frac{4}{3}\alpha_s$

$\Rightarrow V\alpha -\frac{4}{3}\frac{\alpha_s}{r}$ — HALF THE STRENGTH OF $q\bar{q}$ IN A MESON

For a meson, other q combinations (not $r\bar{r}$ $g\bar{g}$ $b\bar{b}$) do not have attractive force.. so do not bind.