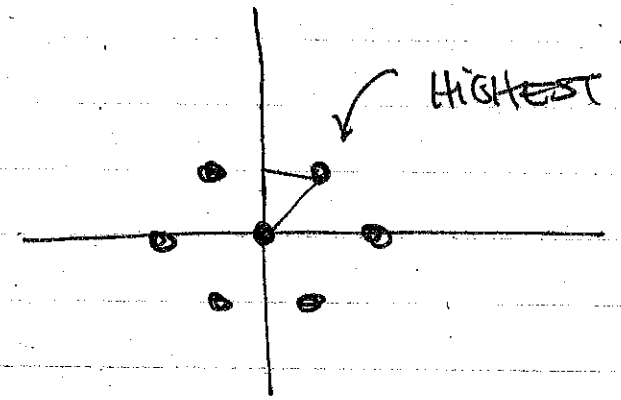
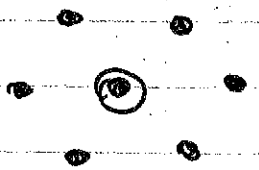
(Adjoint) ← don't say this

1/28 ADDENDUM



outer states: multiplicity = 1
inner state: —— = 2



how many states? 8

CONFIRM: this is REAL
CONFIRM: this is the ADJOINT.

Georgi 2.27 $(ad\ T^a)^{bc} = -if^{abc}$

$(ad\ T^a)^{bc} T^c = -if^{abc} T^c$

$= -if^{abc} T^c$

$= -i\,if^{abc} T^c$

$= iT^b$

CAREFUL:

Georgi (6.8)

$$(\mathrm{ad}\, T^a)\,|T^b\rangle = |T^c\rangle\underbrace{\langle T^c|\,\mathrm{ad}(T^a)\,|T^b\rangle}_{\text{matrix element}}$$

$$(\mathrm{ad}\, T^a)^{cb} = -i f^{acb}$$

$$= |T^c\rangle\,(-i f^{acb})$$

$$= -i\,|f^{bac} T^c\rangle \quad \leftarrow |aT^a + bT^b\rangle = a|T^a\rangle + b|T^b\rangle$$

$$= +i\,|f^{abc} T^c\rangle$$

$$= +i\,|-i[T^a, T^b]\rangle$$

$$= |[T^a, T^b]\rangle \quad \leftarrow \text{doesn't dep on HERMITIAN REP}$$

Q: what is the weight of T^1?

$$\frac{1}{2}\begin{pmatrix} 0 & 1 & \\ 1 & 0 & \\ & & 0 \end{pmatrix}$$

↝ not defined. ↙ should be $T^1/\sqrt{2}$

BETTER: $T^\pm, V^\pm, U^\pm$

what is WEIGHT of $T^\pm$? ↓ well... clearly not normalized ... need 1/2

$$\mathrm{ad}\, T^3\,|T^\pm\rangle = |[T^3, T^\pm]\rangle = \pm 2\,|T^\pm\rangle$$

$$\mathrm{ad}\, T^8\,|T^\pm\rangle = |[T^8, T^\pm]\rangle = 0\,|T^\pm\rangle$$

what is highest weight?

$|V^+\rangle$ has weight $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

what about the others?

$|T^3\rangle$ has weight $(0,0)$
$|T^8\rangle$ has weight $(0,0)$

↑
BC $[H_i, H_j] = 0$
FOR ADJOINT.

WHAT DOES SU(4) WEIGHT DIAGRAM FOR ADJOINT LOOK LIKE?