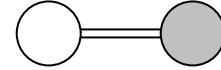


Physics 745 - Group Theory  
Homework Set 33  
Due Wednesday, April 29

1. The group  $SO(5)$  has the Dynkin diagram sketched at right.  
The shorter root can be chosen to be  $\mathbf{s} = (0,1)$ .



- (a) What is the length of the longer root  $\mathbf{r}$ ? Give the coordinates of  $\mathbf{r}$ .
- (b) Use the rules described in class to determine for what positive integers  $n$  the quantities  $\mathbf{r} + n\mathbf{s}$  and  $\mathbf{s} + n\mathbf{r}$  are roots. Write them all out in coordinates.
- (c) Prove or disprove: More roots can be found by adding  $\mathbf{r}$  or  $\mathbf{s}$  to the positive roots we have already found.
- (d) You have found all the positive roots. Find all the negative roots. Find all the zero roots. Make a root diagram. It should be a nice, symmetric pattern.