

(Alt) In[]:=

```
SetDirectory@"C:\\drorbn\\AcademicPensieve\\Projects\\OU";
<< "OU-Programs.m"
```

Loading KnotTheory` version of February 2, 2020, 10:53:45.2097.
 Read more at <http://katlas.org/wiki/KnotTheory>.

(Alt) In[]:=

```
 $\beta = \text{VPB}[5, \{ \{-1, 3, 2\}, \{-1, 4, 2\}, \{-1, 5, 2\}, \{-1, 2, 5\}, \{-1, 5, 2\}, \{-1, 4, 3\}, \{-1, 4, 1\},$ 
 $\{-1, 1, 4\}, \{-1, 3, 4\}, \{1, 4, 5\}, \{-1, 2, 4\}, \{-1, 2, 5\}, \{1, 3, 2\}, \{1, 1, 2\},$ 
 $\{1, 2, 1\}, \{1, 2, 3\}, \{1, 5, 4\}, \{1, 4, 5\}, \{1, 5, 4\}, \{1, 2, 4\}, \{1, 3, 4\}, \{-1, 5, 2\},$ 
 $\{-1, 2, 5\}, \{-1, 5, 2\}, \{-1, 2, 5\}, \{-1, 5, 2\}, \{-1, 4, 1\}, \{-1, 3, 1\}, \{-1, 1, 3\},$ 
 $\{-1, 1, 4\}, \{-1, 4, 1\}, \{-1, 3, 1\}, \{1, 4, 3\}, \{1, 3, 4\}, \{-1, 1, 3\}, \{-1, 5, 3\},$ 
 $\{1, 3, 2\}, \{-1, 3, 2\}, \{-1, 3, 5\}, \{-1, 3, 1\}, \{-1, 3, 4\}, \{-1, 4, 3\}, \{-1, 1, 3\},$ 
 $\{-1, 5, 3\}, \{-1, 2, 3\}, \{-1, 3, 2\}, \{1, 5, 3\}, \{1, 1, 3\}, \{-1, 3, 4\}, \{-1, 4, 3\},$ 
 $\{1, 3, 1\}, \{1, 4, 1\}, \{1, 1, 4\}, \{1, 1, 3\}, \{1, 3, 1\}, \{1, 4, 1\}, \{1, 5, 2\}, \{1, 2, 5\},$ 
 $\{1, 5, 2\}, \{1, 2, 5\}, \{1, 5, 2\}, \{-1, 3, 4\}, \{-1, 2, 4\}, \{-1, 5, 4\}, \{-1, 4, 5\},$ 
 $\{-1, 5, 4\}, \{-1, 2, 3\}, \{-1, 2, 1\}, \{-1, 1, 2\}, \{-1, 3, 2\}, \{1, 2, 5\}, \{1, 2, 4\},$ 
 $\{-1, 4, 5\}, \{1, 3, 4\}, \{1, 1, 4\}, \{1, 4, 1\}, \{1, 4, 3\}, \{1, 5, 2\}, \{1, 2, 5\}, \{1, 5, 2\},$ 
 $\{1, 4, 2\}, \{1, 3, 2\}, \{-1, 5, 4\}, \{-1, 4, 5\}, \{-1, 5, 4\}, \{-1, 4, 5\}, \{-1, 5, 4\},$ 
 $\{-1, 2, 1\}, \{-1, 3, 1\}, \{-1, 1, 3\}, \{-1, 1, 2\}, \{-1, 2, 1\}, \{-1, 3, 1\}, \{1, 2, 3\},$ 
 $\{1, 3, 2\}, \{-1, 1, 3\}, \{-1, 5, 3\}, \{1, 3, 4\}, \{1, 4, 3\}, \{1, 5, 3\}, \{1, 1, 3\}, \{1, 2, 3\},$ 
 $\{1, 3, 2\}, \{1, 3, 1\}, \{1, 3, 5\}, \{1, 3, 4\}, \{-1, 3, 4\}, \{1, 5, 3\}, \{1, 1, 3\}, \{-1, 3, 2\},$ 
 $\{-1, 2, 3\}, \{1, 3, 1\}, \{1, 2, 1\}, \{1, 1, 2\}, \{1, 1, 3\}, \{1, 3, 1\}, \{1, 2, 1\}, \{1, 5, 4\},$ 
 $\{1, 4, 5\}, \{1, 5, 4\}, \{1, 4, 5\}, \{1, 5, 4\} \} /. \{ \{1, i_, j_ \} \Rightarrow \sigma_{i,j}, \{-1, i_, j_ \} \Rightarrow \bar{\sigma}_{i,j} \}$ 
```

(Alt) Out[]:=

```
VPB[5,  $\bar{\sigma}_{3,2}, \bar{\sigma}_{4,2}, \bar{\sigma}_{5,2}, \bar{\sigma}_{2,5}, \bar{\sigma}_{5,2}, \bar{\sigma}_{4,3}, \bar{\sigma}_{4,1}, \bar{\sigma}_{1,4}, \bar{\sigma}_{3,4}, \sigma_{4,5}, \bar{\sigma}_{2,4}, \bar{\sigma}_{2,5}, \sigma_{3,2}, \sigma_{1,2},$ 
 $\sigma_{2,1}, \sigma_{2,3}, \sigma_{5,4}, \sigma_{4,5}, \sigma_{5,4}, \sigma_{2,4}, \sigma_{3,4}, \bar{\sigma}_{5,2}, \bar{\sigma}_{2,5}, \bar{\sigma}_{5,2}, \bar{\sigma}_{2,5}, \bar{\sigma}_{5,2}, \bar{\sigma}_{4,1}, \bar{\sigma}_{3,1}, \bar{\sigma}_{1,3},$ 
 $\bar{\sigma}_{1,4}, \bar{\sigma}_{4,1}, \bar{\sigma}_{3,1}, \sigma_{4,3}, \sigma_{3,4}, \bar{\sigma}_{1,3}, \bar{\sigma}_{5,3}, \sigma_{3,2}, \bar{\sigma}_{3,2}, \bar{\sigma}_{3,5}, \bar{\sigma}_{3,1}, \bar{\sigma}_{3,4}, \bar{\sigma}_{4,3}, \bar{\sigma}_{1,3}, \bar{\sigma}_{5,3},$ 
 $\bar{\sigma}_{2,3}, \bar{\sigma}_{3,2}, \sigma_{5,3}, \sigma_{1,3}, \bar{\sigma}_{3,4}, \bar{\sigma}_{4,3}, \sigma_{3,1}, \sigma_{4,1}, \sigma_{1,4}, \sigma_{1,3}, \sigma_{3,1}, \sigma_{4,1}, \sigma_{5,2}, \sigma_{2,5}, \sigma_{5,2}, \sigma_{2,5},$ 
 $\sigma_{5,2}, \bar{\sigma}_{3,4}, \bar{\sigma}_{2,4}, \bar{\sigma}_{5,4}, \bar{\sigma}_{4,5}, \bar{\sigma}_{5,4}, \bar{\sigma}_{2,3}, \bar{\sigma}_{2,1}, \bar{\sigma}_{1,2}, \bar{\sigma}_{3,2}, \sigma_{2,5}, \sigma_{2,4}, \bar{\sigma}_{4,5}, \sigma_{3,4}, \sigma_{1,4},$ 
 $\sigma_{4,1}, \sigma_{4,3}, \sigma_{5,2}, \sigma_{2,5}, \sigma_{5,2}, \sigma_{4,2}, \sigma_{3,2}, \bar{\sigma}_{5,4}, \bar{\sigma}_{4,5}, \bar{\sigma}_{5,4}, \bar{\sigma}_{4,5}, \bar{\sigma}_{5,4}, \bar{\sigma}_{2,1}, \bar{\sigma}_{3,1}, \bar{\sigma}_{1,3},$ 
 $\bar{\sigma}_{1,2}, \bar{\sigma}_{2,1}, \bar{\sigma}_{3,1}, \sigma_{2,3}, \sigma_{3,2}, \bar{\sigma}_{1,3}, \bar{\sigma}_{5,3}, \sigma_{3,4}, \sigma_{4,3}, \sigma_{5,3}, \sigma_{1,3}, \sigma_{2,3}, \sigma_{3,2}, \sigma_{3,1}, \sigma_{3,5}, \sigma_{3,4},$ 
 $\bar{\sigma}_{3,4}, \sigma_{5,3}, \sigma_{1,3}, \bar{\sigma}_{3,2}, \bar{\sigma}_{2,3}, \sigma_{3,1}, \sigma_{2,1}, \sigma_{1,2}, \sigma_{1,3}, \sigma_{3,1}, \sigma_{2,1}, \sigma_{5,4}, \sigma_{4,5}, \sigma_{5,4}, \sigma_{4,5}, \sigma_{5,4} \}$ 
```

(Alt) In[]:=

```
Length@ $\beta - 1$ 
```

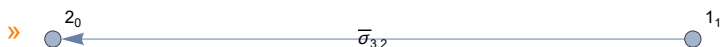
(Alt) Out[]:=

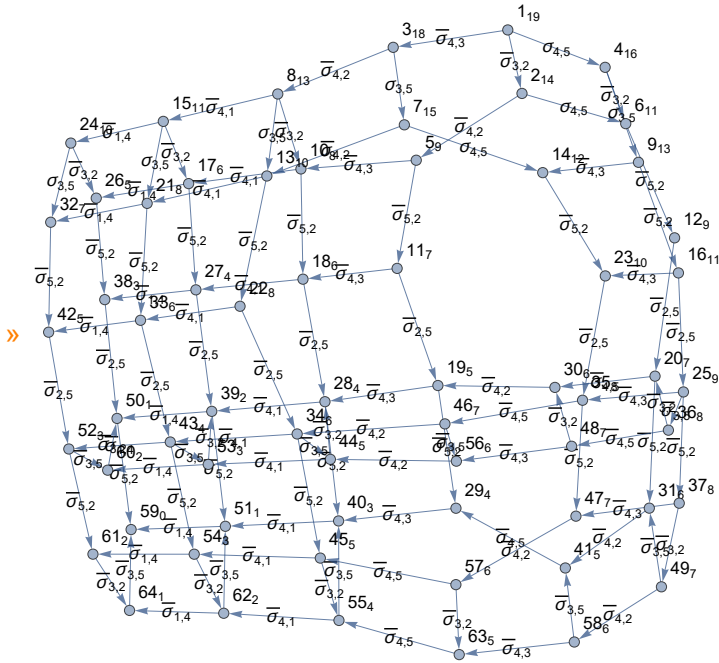
122

(Alt) In[]:=

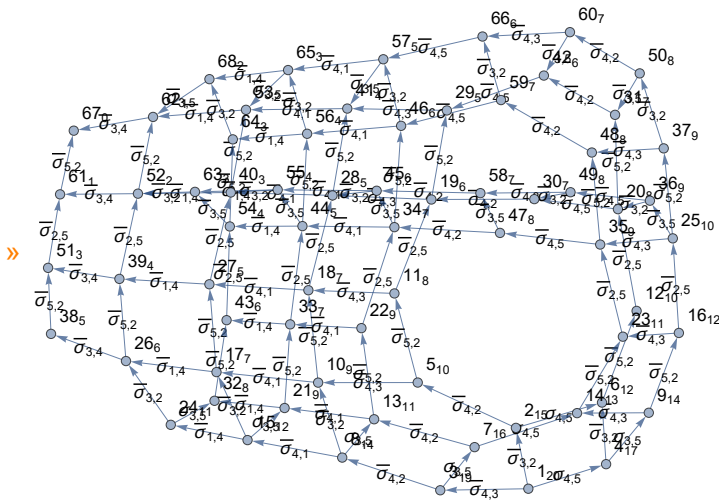
```
tab = Table[
  Echo@{k - 1, Take[ $\beta$ , k]};
  Echo@ExtractionGraph[Take[ $\beta$ , k]],
  {k, 2, Length[ $\beta$ ]}
];
```

» {1, VPB[5, $\bar{\sigma}_{3,2}$]}

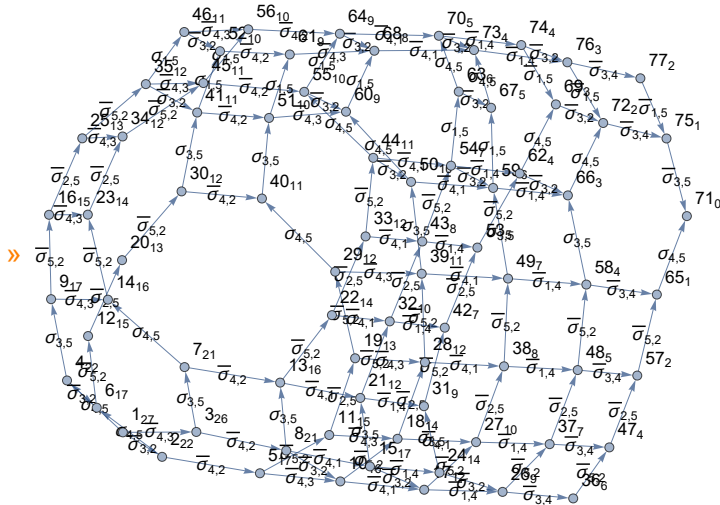




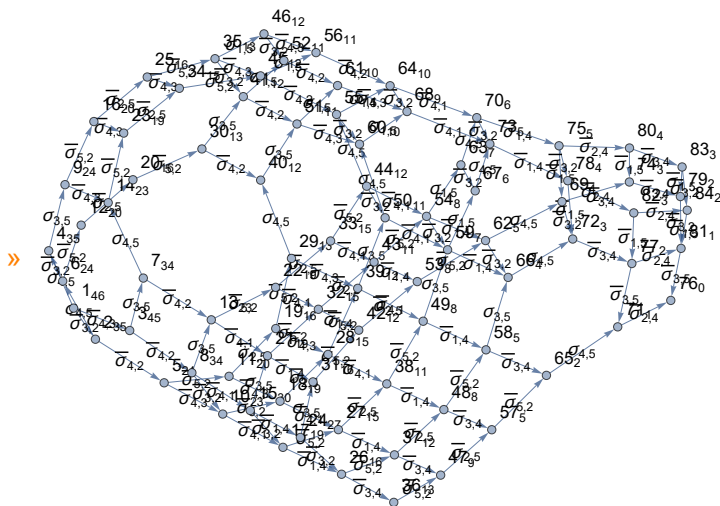
» {9, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$] }



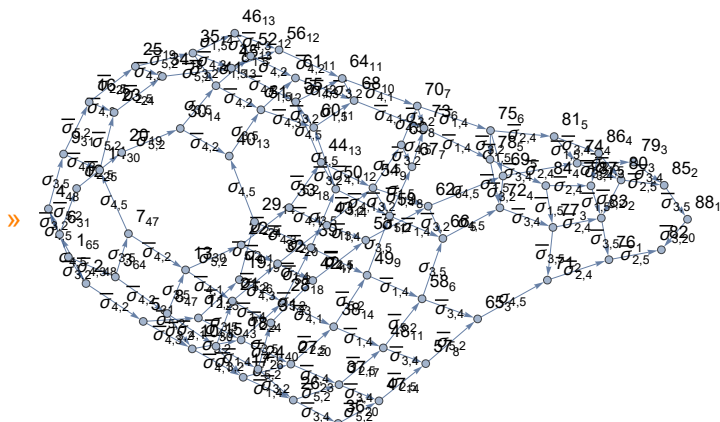
» {10, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$] }



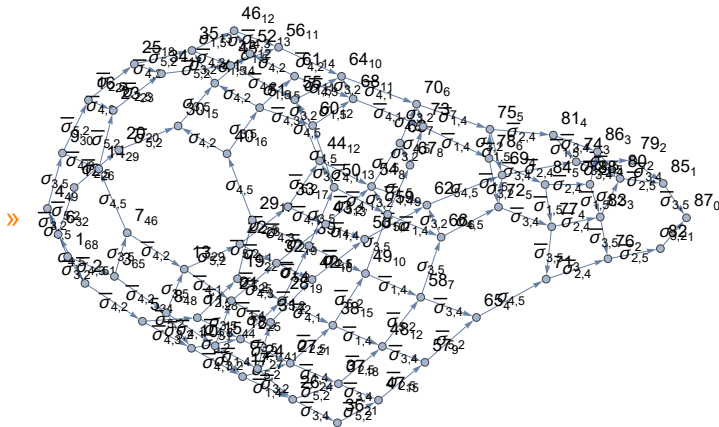
» {11, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$] }



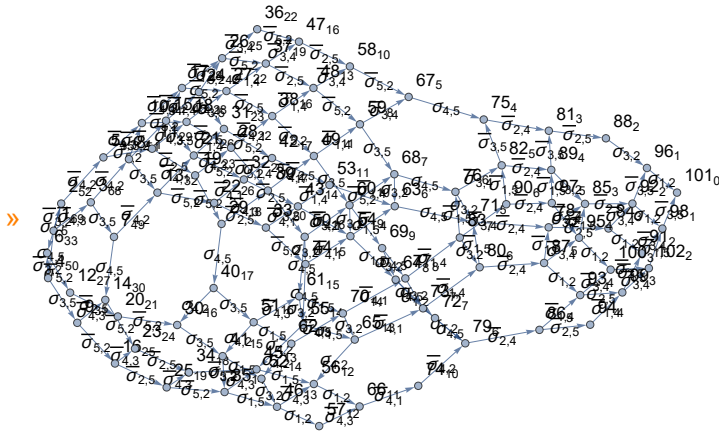
» {12, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$] }



» {13, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$] }

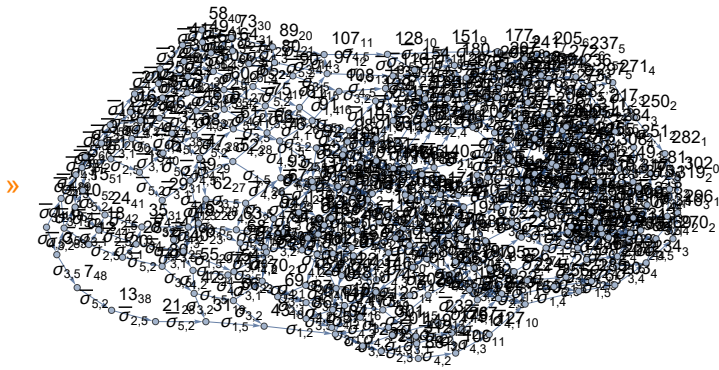


» {14, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$]}



» {15, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$]}

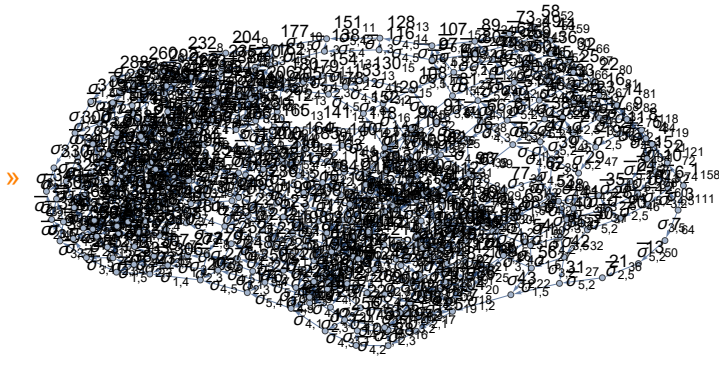




» {17, VPB [5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$] }



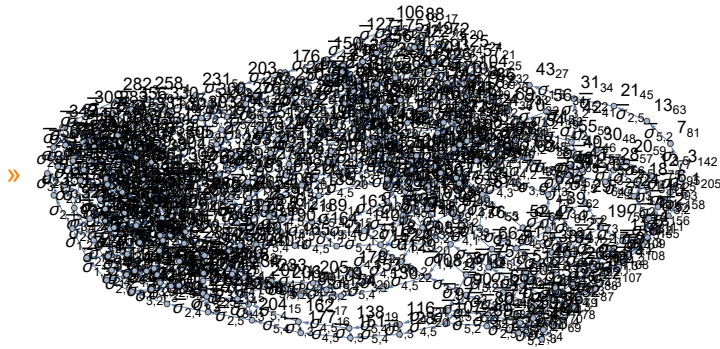
» {18, VPB [5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$, $\sigma_{4,5}$] }



» {19, VPB [5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$, $\sigma_{4,5}$, $\sigma_{5,4}$] }



- » {20, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$,
 $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$, $\sigma_{4,5}$, $\sigma_{5,4}$, $\sigma_{2,4}$]}



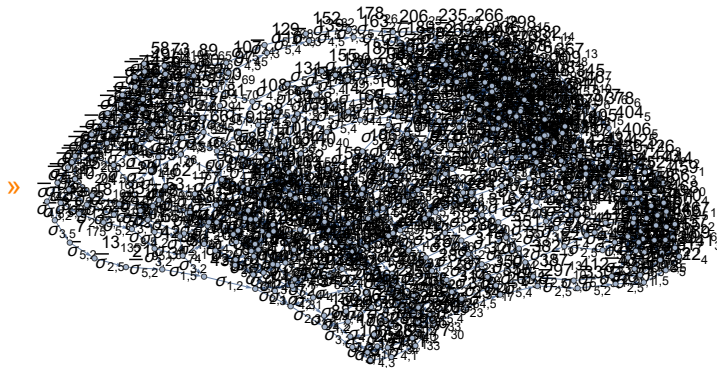
- » {21, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$,
 $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$, $\sigma_{4,5}$, $\sigma_{5,4}$, $\sigma_{2,4}$, $\sigma_{3,4}$]}



- » {22, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$,
 $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$, $\sigma_{4,5}$, $\sigma_{5,4}$, $\sigma_{2,4}$, $\sigma_{3,4}$, $\bar{\sigma}_{5,2}$]}



- » {23, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$,
 $\sigma_{4,5}$, $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$, $\sigma_{4,5}$, $\sigma_{5,4}$, $\sigma_{2,4}$, $\sigma_{3,4}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$]}



» {24, VPB[5, $\bar{\sigma}_{3,2}$, $\bar{\sigma}_{4,2}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{4,3}$, $\bar{\sigma}_{4,1}$, $\bar{\sigma}_{1,4}$, $\bar{\sigma}_{3,4}$, $\sigma_{4,5}$,
 $\bar{\sigma}_{2,4}$, $\bar{\sigma}_{2,5}$, $\sigma_{3,2}$, $\sigma_{1,2}$, $\sigma_{2,1}$, $\sigma_{2,3}$, $\sigma_{5,4}$, $\sigma_{4,5}$, $\sigma_{5,4}$, $\sigma_{2,4}$, $\sigma_{3,4}$, $\bar{\sigma}_{5,2}$, $\bar{\sigma}_{2,5}$, $\bar{\sigma}_{5,2}$]}

(Alt) Out[]=

\$Aborted