**NPTEL**

**NPTEL ONLINE CERTIFICATION COURSE**

**Discrete Mathematics**
**Graph Theory – 3 &**
**Generating Functions**

**NetworkX – Sub graphs**

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We are now going to see how to obtain a sub graph from the given graph, let me say I am going to create a graph K, a star graph, okay, so it will be nx.star, yes, you people must remember that we must first import NetworkX as nx before starting, creating, any graph,
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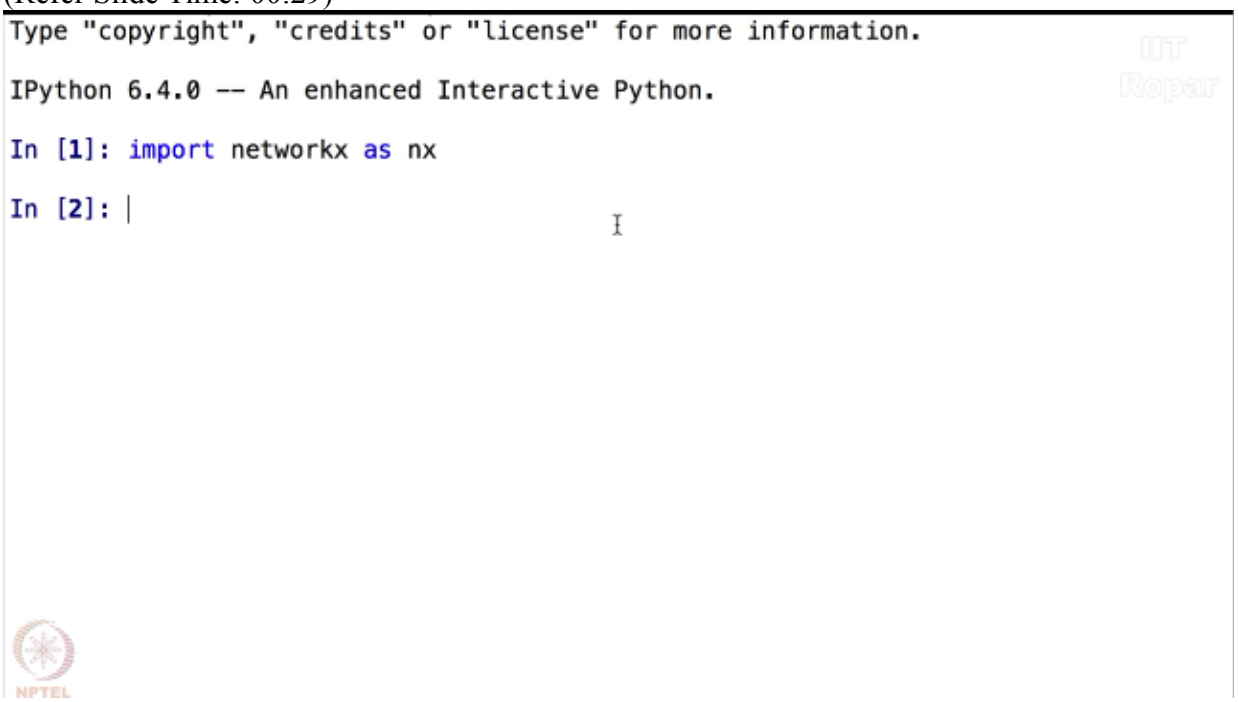


now so I am going to create the star graph, K = nx.star_graph let me say on 10 vertices,
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IPython 6.4.0 -- An enhanced Interactive Python.

In [1]: import networkx as nx

In [2]: K=nx.star_graph(10)

In [3]:
```

I'm going to give nx.draw K but with labels as true, do you see these 10 vertices here,
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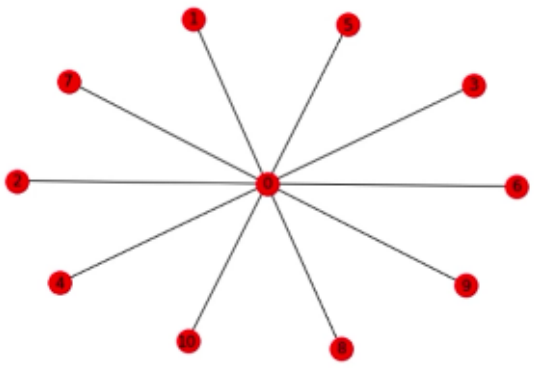
```
In [1]: import networkx as nx

In [2]: K=nx.star_graph(10)

In [3]: nx.draw(K,with_labels=1)
```




```
In [4]:
```

the labels have started from 0 right, but please note here we have 0, 1, 2, 3, and so on it has given 11 vertices in all, what we mean by that? There are 10 vertices surrounding the center vertex, clear, that's okay. Now let us see how to create a sub graph of this graph, I am going to write name my nodes which I am going to pick up, let me say nodes as 0, 3, and 5,
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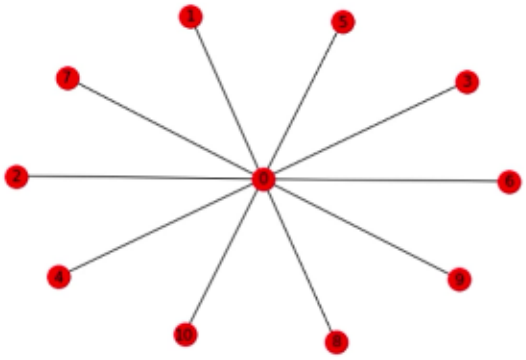
```
In [3]: nx.draw(K,with_labels=1)
```



```
In [4]: nodes=[0,3,5]
```

right, now I am going to create a sub graph of these nodes 0, 3, and 5, now I've picked up these nodes, I am going to label the sub graph as K1 = K.subgraph, because my subgraph is going to be from the graph K, subgraph of which nodes? Of the nodes which I have selected here,

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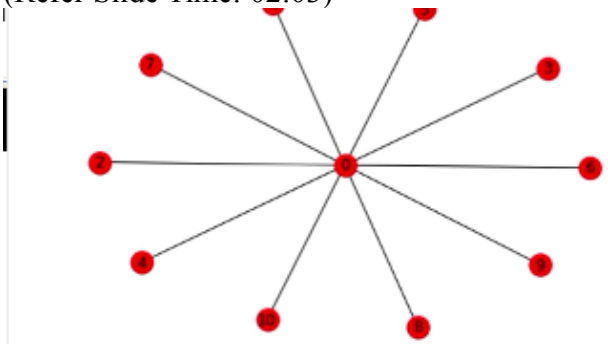

```
In [4]: nodes=[0,3,5]

In [5]: K1=K.subgraph(nodes)

In [6]:
```

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is it clear? Now I am going to draw K1, so it is going to be nx.draw, but again with labels, so with labels as true,

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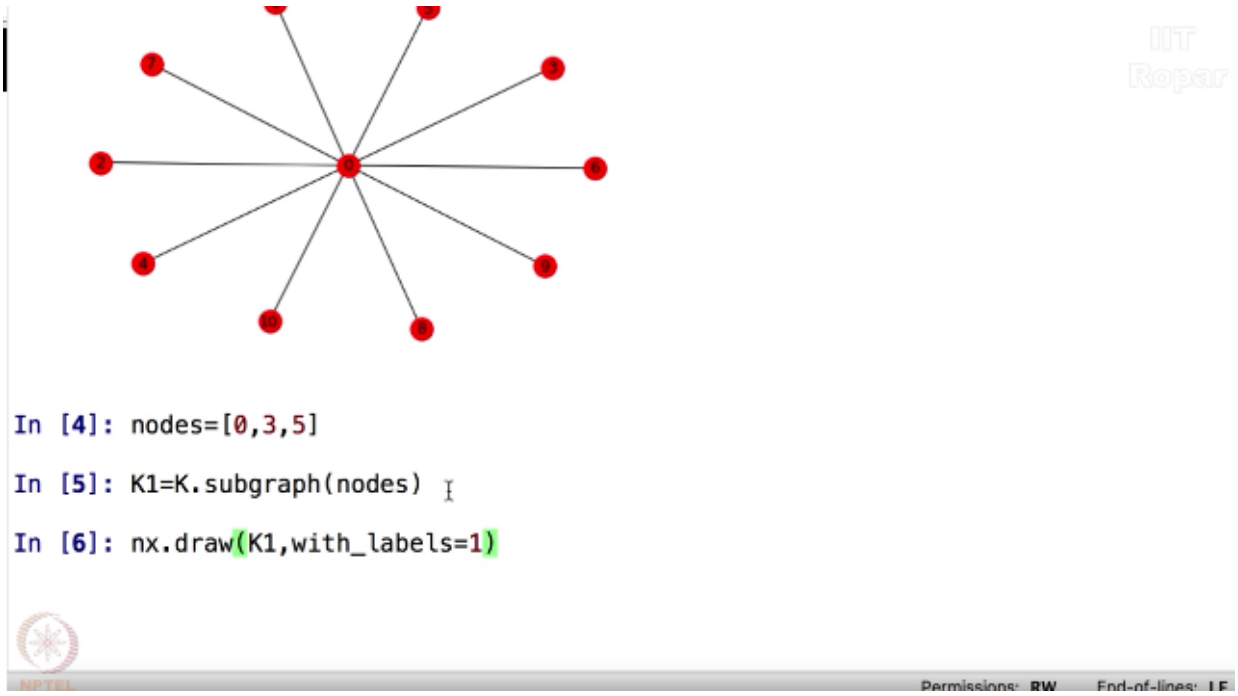


so do you see we have 0, 3, and 5, 0, 3 and 5 here from this graph 0 was here, 3 here, and 5 is here,
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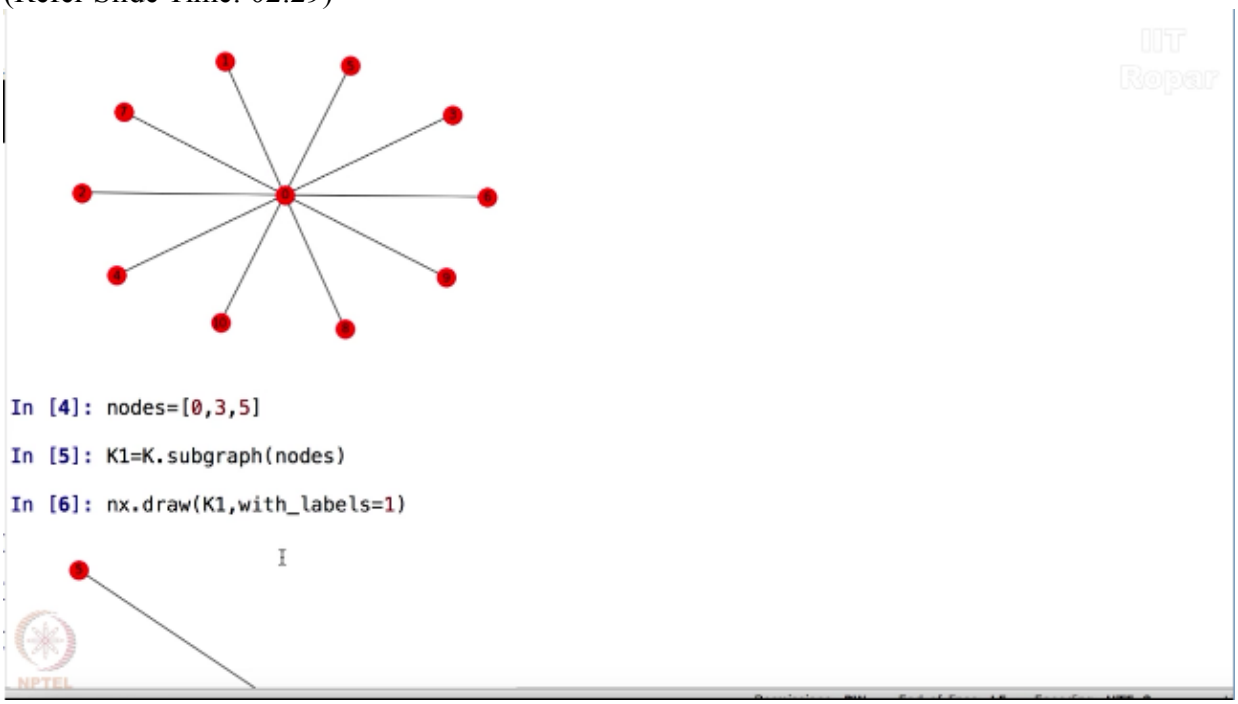


so we have obtained the subgraph of these nodes.

Now supposing I create node list as another way of picking up the nodes as 1, 4, 6, and 9 let me say,
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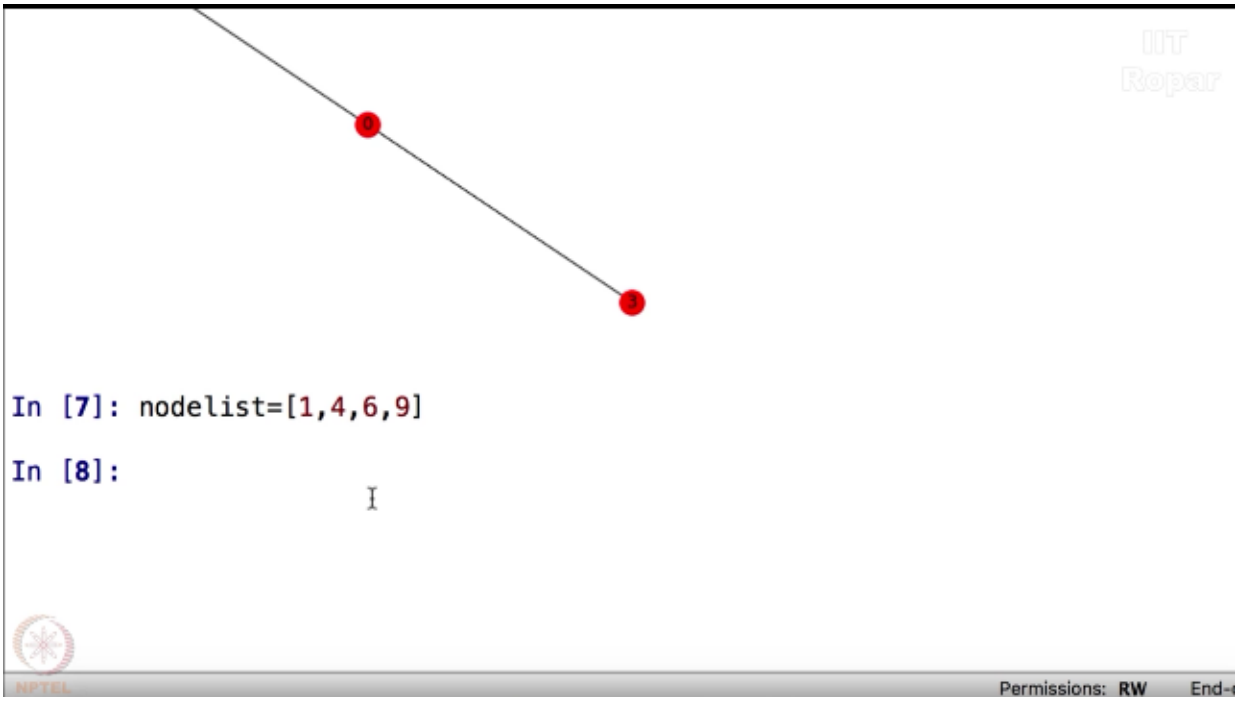


and I'm going to create the subgraph K2 as K.subgraph of node list, so I'm going to pick up these nodes 1, 4, 6, 9, I'm going to draw them nx.draw and it's going to be K2 this time, right, K2,

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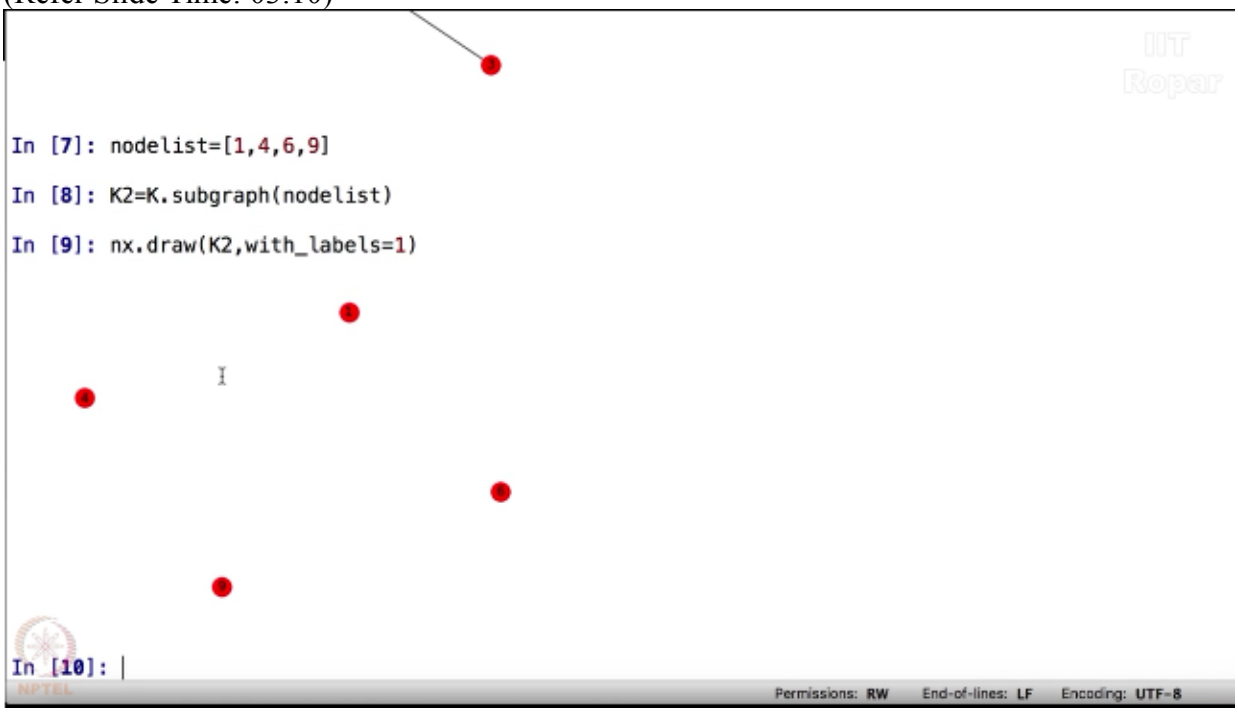


do you see I have obtained all isolated vertices or rather it's a disconnected graph, well you must be knowing the reason because I haven't selected 0 here from the nodes I picked up, 0 was the center vertex, right, and hence this graph is disconnected.

Now we will learn a new graph something called as G, or G equals let me say ego, and nx.ego graph, what I mean by ego graph? You will be observing that I'm going to explain once the graph is created, from this graph K which was earlier created and I'm going to name one, what does this mean?

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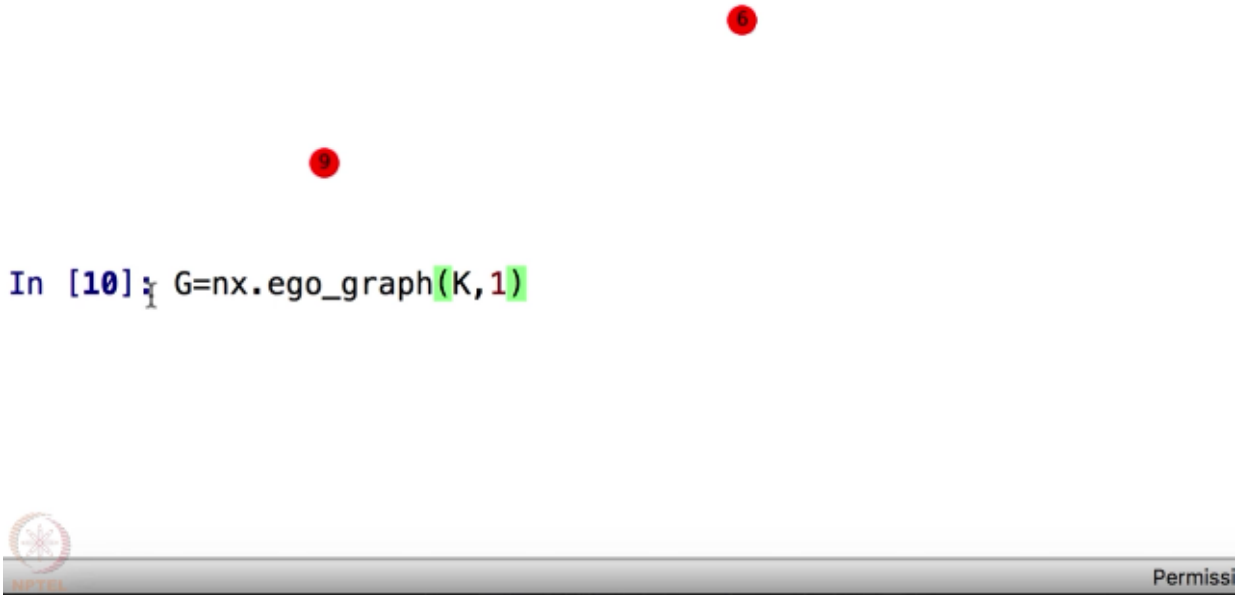


I have created a new graph called the ego graph, I have named it as G and it is going to be created from this graph K, which means it is another type of a subgraph, so I have created this ego graph which is a subgraph of K, but what does this one represent? If I give a particular vertex here this graph G will be the subgraph of all the neighboring nodes of one, right, so it is going to be an induced subgraph with this node as the center one, and all its neighbors surrounding it, right.

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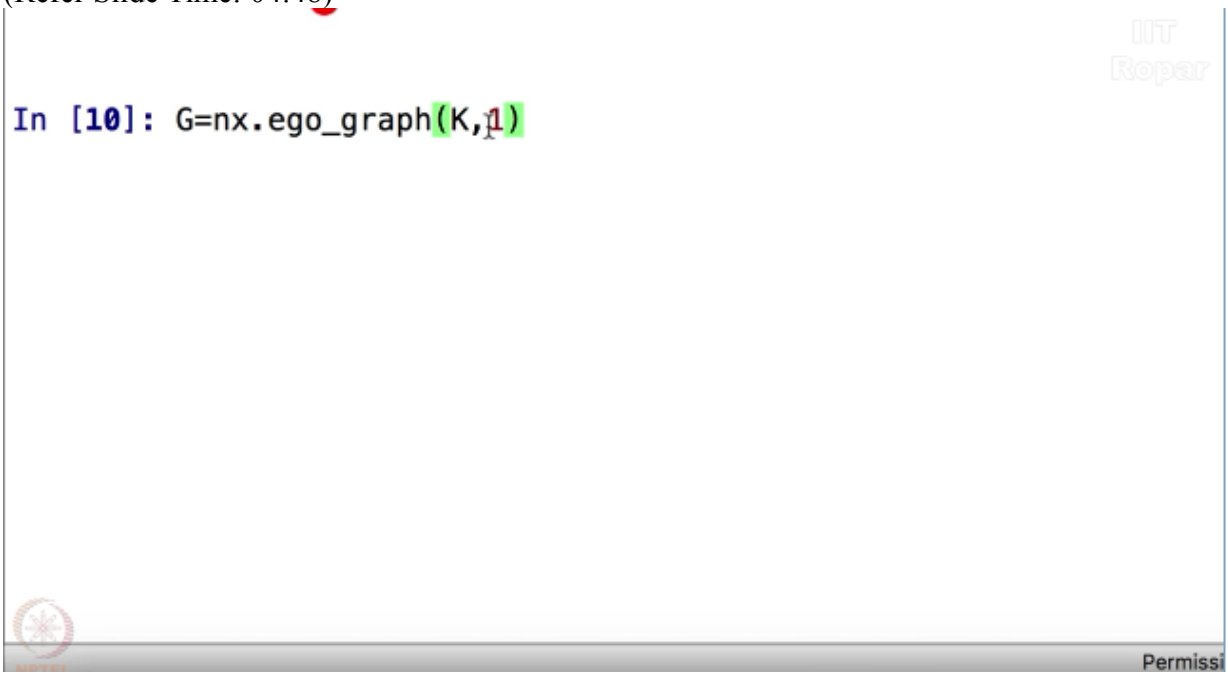


Now let us check, so it is going to be nx.draw G with labels true,

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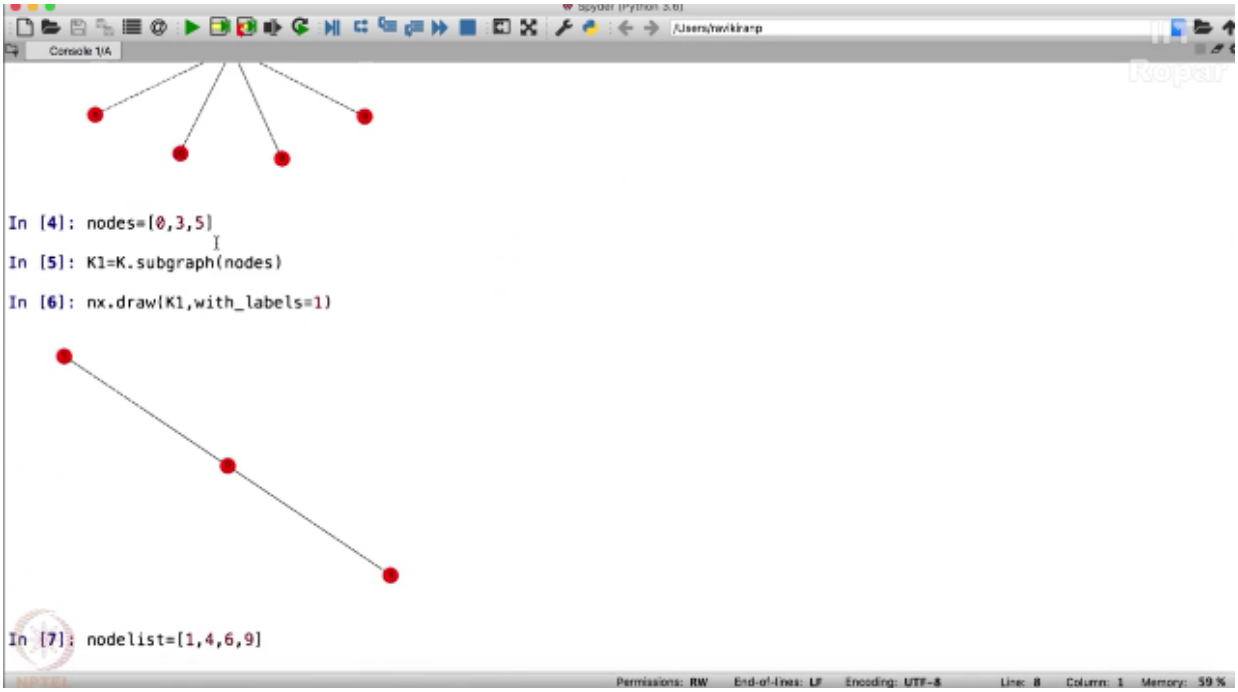


so do you see in the graph K, so in this graph one was having only 0 as the neighbor and hence if I give this vertex 1 here it is returning only the neighbor 0 with an edge here, so this is a subgraph of this graph K called particularly the ego graph.

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