

NPTEL

NPTEL ONLINE CERTIFICATION COURSE

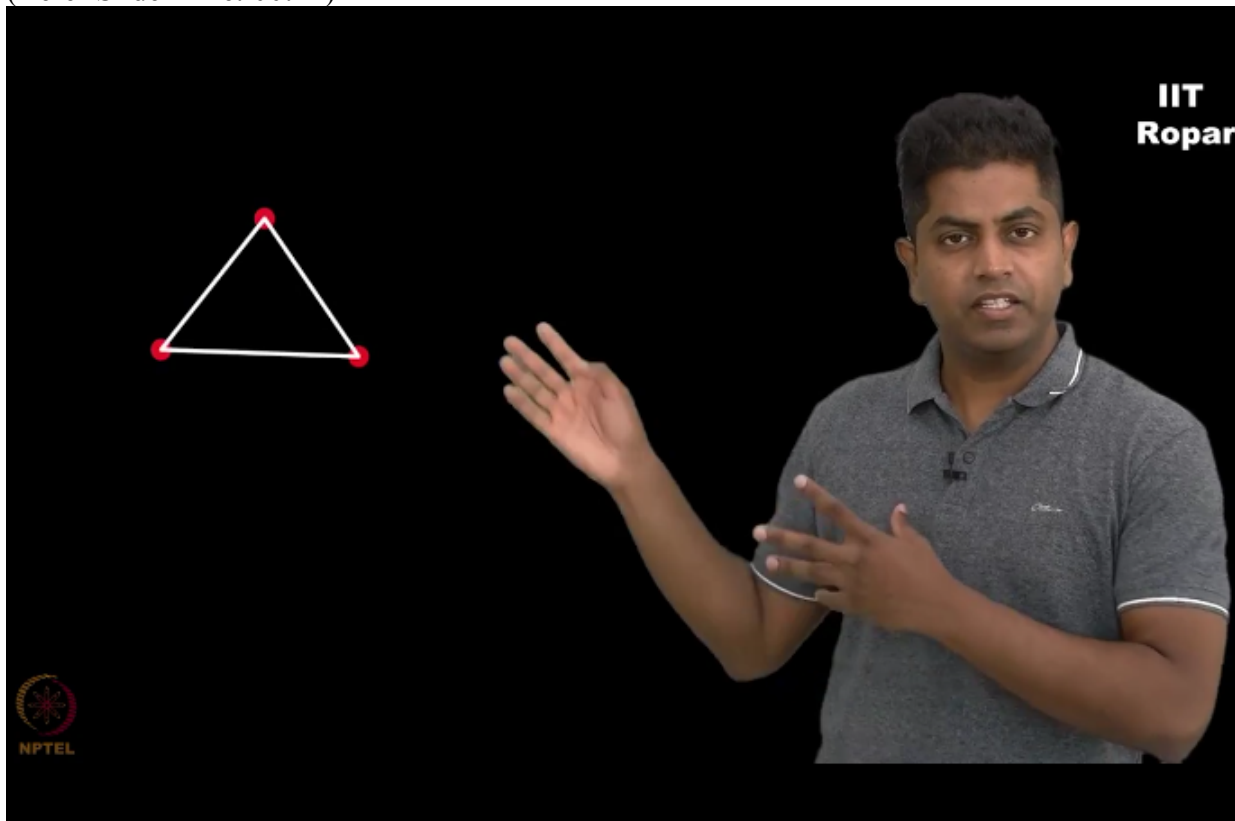
**Discrete Mathematics
Graph Theory – 2**

$$V - E + R = 2$$

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Let me introduce a very nice concept, nice and cute, so nice that you can explain this to a school kid, it's surprisingly true, so before that couple of definitions, do you look at this triangle,

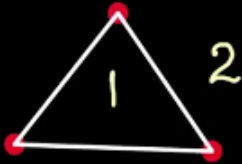
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it is your C_3 , a cycle with 3 vertices, it has 3 vertices let's make a note of it, 3 edges, and please note let me define what is a region, 2 regions, region 1, region 2, you will get to know what the regions are, what one means by region as I give you more examples.

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3 Vertices
3 Edges
2 Regions

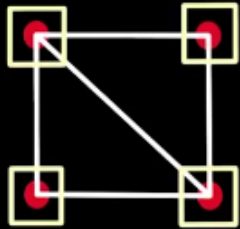


Look at the next example, C_4 with a diagonal let say,
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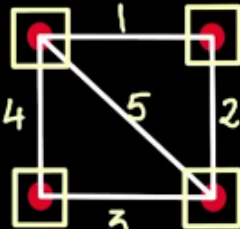
how many vertices do you have? 1, 2, 3, and 4,
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The diagram shows a graph with four vertices arranged in a square. The vertices are marked with red dots inside yellow squares. The edges are white lines connecting the vertices: a horizontal edge at the top, a horizontal edge at the bottom, a vertical edge on the left, a vertical edge on the right, and a diagonal edge from the top-left vertex to the bottom-right vertex.



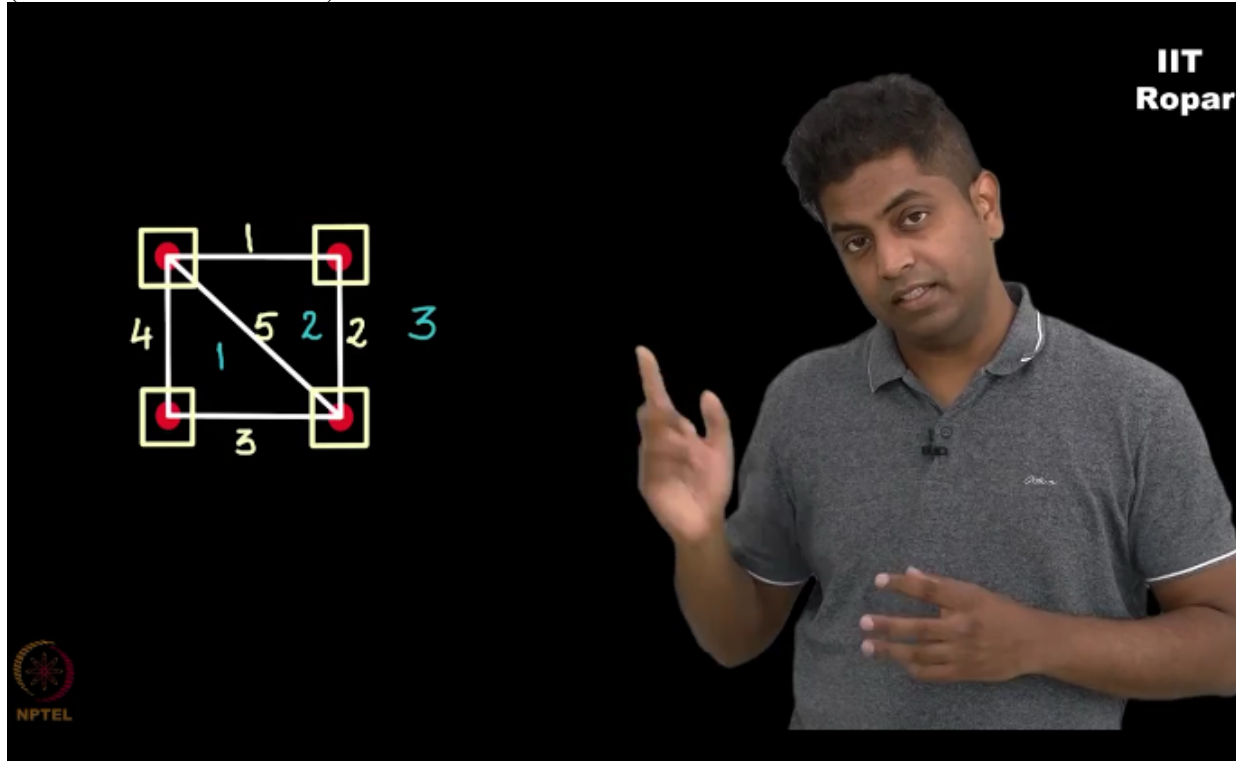
how many edges do you have? 1, 2, 3, 4, 5,
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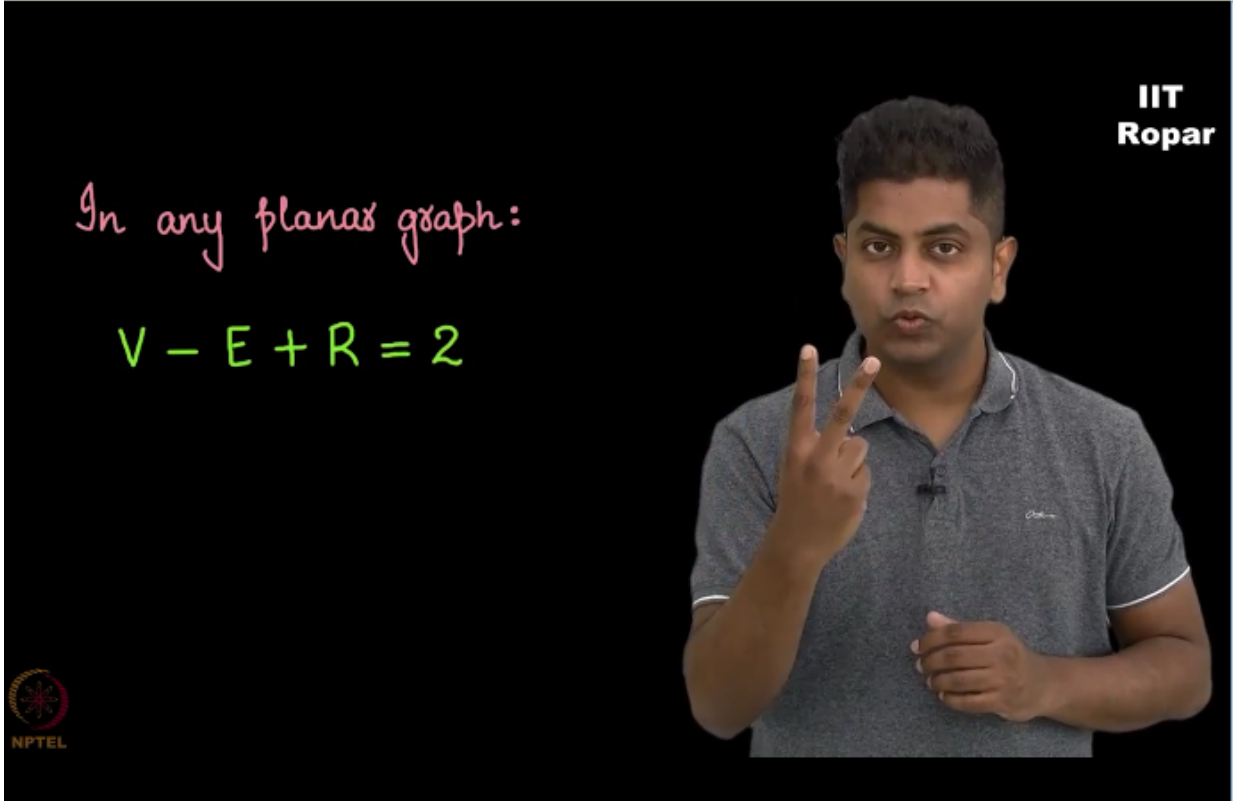
The diagram shows the same graph as in the previous slide, but with the edges numbered. Edge 1 is the top horizontal edge, edge 2 is the right vertical edge, edge 3 is the bottom horizontal edge, edge 4 is the left vertical edge, and edge 5 is the diagonal edge from the top-left vertex to the bottom-right vertex.



right, how many regions do you have? 1, 2, 3,
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now you know what you mean by regions, correct, a surprising fact you take any planar graph, as you'd have observed you can take about regions only for planar graphs, right, if you take a planar graph count the number of vertices, the edges, and the regions, surprisingly they are sort of connected and related, and surprisingly this is always true that $V - E + R$ happens to be 2.
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