Induced subgraphs
(and isomorphic graphs)

Subgraph

A graph is a set of vertices V and a set of edges E between them.

E.g. V={1,2,3,4}, E={{1,3},{2,4},{2,3}} (draw it!)

A subgraph is any subset of vertices and any subset of edges between these. Informally, delete all other vertices (and of course the edges with the deleted vertices being at least one vertex of the edge), and keeping whichever of the remaining edges "you want to keep"

Induced Subgraph

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An induced subgraph is any subset of vertices and any subset of edges between these. Informally, delete all other vertices (and of course the edges with the deleted vertices being at least one vertex of the edge), and keeping all of the remaining edges ~~"you want to keep"~~

Induced Subgraph

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There is another way of thinking of it that makes this perfectly natural. The vertices usually come from some data (they are the "objects"), the edges are the relationships between those data objects. An induced subgraph is the graph you would have gotten if instead you took a subset of the original data – not collected the whole data.

Subgraph and Induced Subgraph

A graph is a set of vertices V and a set of edges E between them.

E.g. V={1,2,3,4}, E={{1,3},{2,4},{2,3}} (draw it!)
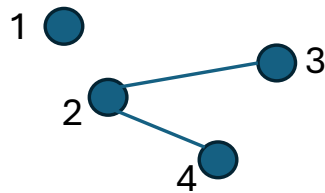
For each of the following – are they subgraphs? Are they induced subgraphs? Draw them.

(a) V={1,2,3,4}, E={{1,3},{2,4},{2,3}}

(b) V={1,2,3,4}, E={}

(c) V={1,2,4}, E={{2,4}}

(d) V={1,2,4}, E={}
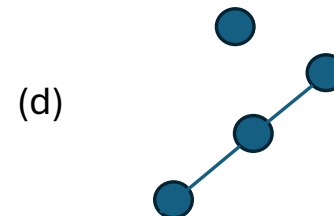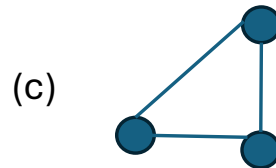
(e) V={1,2,3,4}, E={{1,3}{2,3}}

(f) V={1,2,4}, E={{2,4}}

Subgraph and Induced Subgraph

A graph is a set of vertices V and a set of edges E between them.
E.g. V=[4], E given as drawn

For each of the following – are they isomorphic to subgraphs? Are they isomorphic to induced subgraphs?

(a)
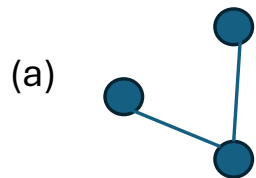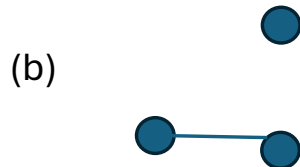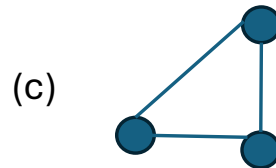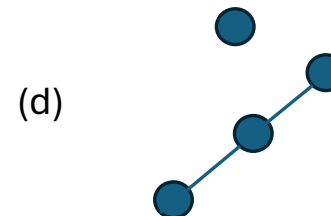
(b)

(c)

(d)

(e)

Subgraph and Induced Subgraph

A graph is a set of vertices V and a set of edges E between them.
E.g. V=[4], E given as drawn

For each of the following – are they isomorphic to subgraphs? Are they isomorphic to induced subgraphs?

(a)
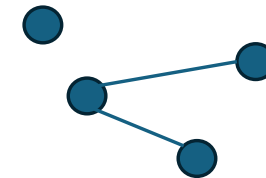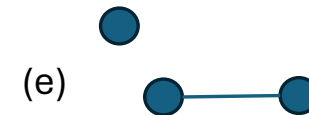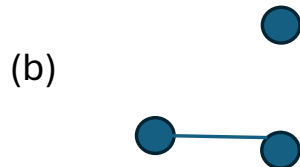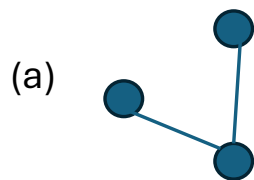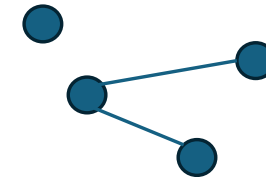
Yes to both.
(there is only one possible
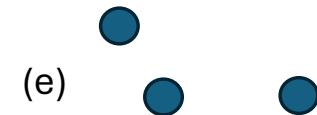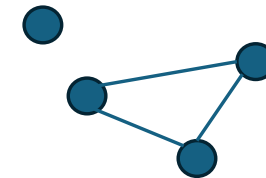copy - because vertex of
degree 2

(b)

Yes to both.
How many copies?

(c)

No to both.
There are no
triangles anywhere
in original graph

(d)

Yes to both –
isomorphic to
original graph

(e)

Yes to both –
how many
copies?
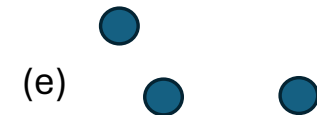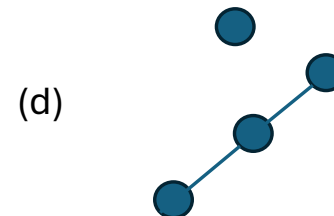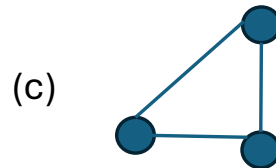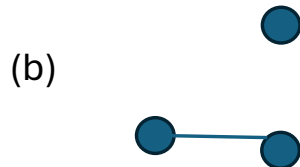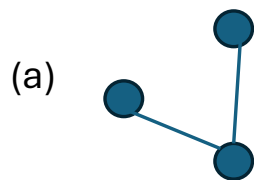
Subgraph and Induced Subgraph

A graph is a set of vertices V and a set of edges E between them.
E.g. V=[4], E given as drawn

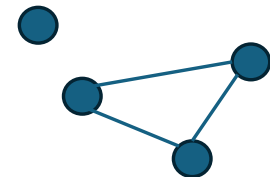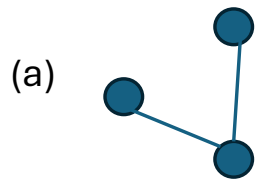For each of the following – are they isomorphic to subgraphs? Are they isomorphic to induced subgraphs?

(a)

(b)

(c)

(d)

(e)

Subgraph and Induced Subgraph

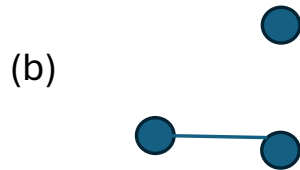A graph is a set of vertices V and a set of edges E between them.
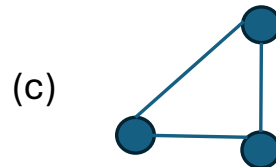E.g. V=[4], E given as drawn

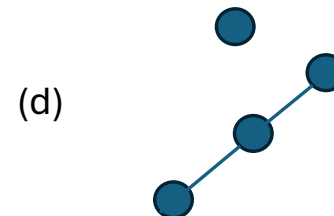For each of the following – are they isomorphic to subgraphs? Are they isomorphic to induced subgraphs?
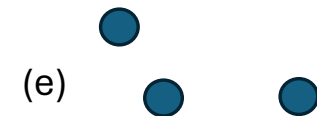
(a)
Yes to subgraph
How many copies?

(b)
Yes to both.
How many copies?

(c)
Yes to both.
How many copies?

(d)
Yes to subgraph
How many copies?

(e)
Yes to subgraph -
how many copies?