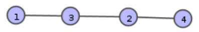
Cheatsheet for YAGS

Graph definitions

Adjacency list

`g:=GraphByAdjacencies([[],[4],[1,2],[]])`



Adjacency matrix

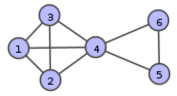
`M:=[[false, true, false], [true, false, true], [false, true, false]]; g:=GraphByAdjMatrix(M);`

List of edges

`g:=GraphByEdges([[1,2],[2,3],[3,4]]);`

Complete cover

`g:=GraphByCompleteCover([[1,2,3,4],[4,5,6]]);`

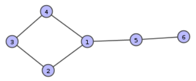


By relation

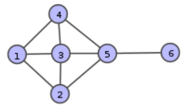
`f:=function(x,y) return Intersection(x,y)<>[]; end;;`
`g:=GraphByRelation([[1,2,3],[3,4,5],[5,6,7]],f);`

By walks

`g:=GraphByWalks([1,2,3,4,1],[1,5,6]);`



`g:=GraphByWalks([1,[2,3,4],5],[5,6]);`



As intersection graph

`g:=IntersectionGraph([[1,2,3],[3,4,5],[5,6,7]]);`

As a copy

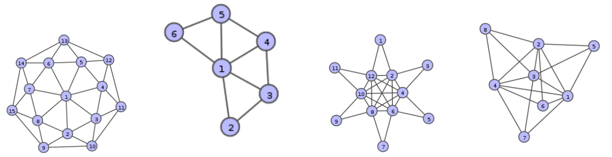
`h:=CopyGraph(g)`

As an induced subgraph

`h:=InducedSubgraph(g,[3,4,6]);`

Graph families (with parameters)

- `g:=DiscreteGraph(n)`
- `g:=CompleteGraph(n)`
- `g:=PathGraph(n)` n vertices.
- `g:=CycleGraph(n)`
- `g:=CubeGraph(n)`
- `g:=OctahedralGraph(n)`
- `g:=JohnsonGraph(n,r)` Vertices are subsets of $\{1,2,\dots,n\}$ with r elements, edges between subsets with intersection of $r-1$ elements.
- `g:=Circulant(n,J)` Second paramenter is a list of jumps
- `g:=CompleteBipartiteGraph(n,m)`
- `g:=CompleteMultipartiteGraph(n1,n2[, n3 ...])`
- `g:=TorusGraph(n,m)`
- `g:=TreeGraph(L)` L is a list. Vertices at depth k have `L[k]` children.
- `g:=TreeGraph(n,k)` Same as `TreeGraph([n,n,..,n])` (the list has length k)
- `g:=WheelGraph(n)`
- `g:=WheelGraph(7,2)` Second optional parameter is the radius of the wheel.
- `g:=FanGraph(4);`
- `g:=SunGraph(6);`
- `g:=SpikyGraph(4);`
- Examples: Wheel, Fan, Sun, Spiky:



Named graphs

Platonic

`Tetrahedron`, `Octahedron`, `Cube`, `Dodecahedron`, `Icosahedron`.

Other

`TrivialGraph`, `DiamondGraph`, `ClawGraph`, `HouseGraph`, `BullGraph`, `AntennaGraph`, `KiteGraph`, `AGraph`, `ChairGraph`, `DartGraph`, `DominoGraph`, `FishGraph`, `GemGraph`, `HouseGraph`, `ParachuteGraph`, `ParapluieGraph`, `PawGraph`, `PetersenGraph`, `RGraph`, `SnubDisphenoid`.

Random graphs

- `g:=RandomGraph(n)`
- `g:=RandomGraph(n,p)` Graph with n vertices, each edge with probability p to appear.

New graphs from old

- `h:=RemoveVertices(g,[1,3]);`
- `h:=AddEdges(g,[[1,2]]);`
- `h:=RemoveEdges(g,[[1,2],[3,4]]);`

Parameters

- `Order(g)`
- `Size(g)`
- `CliqueNumber(g)`
- `VertexDegree(g,v)`
- `MaxDegree(g)`
- `MinDegree(g)`
- `Girth(g)`
- `NumberOfCliques(g)`
- `NumberOfConnectedComponents(g)`

Boolean tests

- `IsCompleteGraph(g)`
- `IsCliqueHelly(g)`
- `IsDiamondFree(g)`
- `IsEdge(g,x,y)` or `IsEdge(g,[x,y])`
- `IsIsomorphicGraph(g,h)`
- `IsCompactSurface(g)`
- `IsSurface(g)`
- `IsLocallyConstant(g)`
- `IsLocallyH(g,h)`
- `IsLoopless(g)`

Products

- `p=BoxProduct(g,h)`
- `p=TimesProduct(g,h)`
- `p=BoxTimesProduct(g,h)`
- `p=DisjointUnion(g,h)`
- `p=Join(g,h)`
- `p=GraphSum(g,l)` l is a list of graphs. Suppose that g has n vertices. In the disjoint union of the first n graphs of l (using `TrivialGraphs` if needed to fill n slots), add all edges between graphs corresponding to adjacent vertices in g.
- `p=Composition(g,h)` is the same as `GraphSum(g,l)`, where l is a list of length the order of g, with all components equal to h.

Operators

- `h:=CliqueGraph(g)`
- `h:=CliqueGraph(g,m)` Stops when a maximum of m cliques have been found.
- `h:=LineGraph(g)`
- `h:=ComplementGraph(g)`
- `h:=Cone(g)`
- `h:=Suspension(g)`
- `h:=ParedGraph(g)`
- `h:=CompletelyParedGraph(g)`
- `h:=QuotientGraph(g,p)` p is a partition of vertices. The vertices of h are the parts of p, with two vertices adjacent if there are two vertices adjacent in g in the corresponding parts. Singletons in p may be omitted.
- `h:=QuotientGraph(g,l1,l2)` $l1, l2$ are lists of vertices of the same length, with repetitions allowed. In h, each vertex of the first list is identified with the corresponding vertex in the second list.
- `h:=Link(g,x)` The subgraph of g induced by the neighbors of x.
- `h:=SpanningForest(g)`

Lists

- `VertexNames(g)`
- `Cliques(g)`
- `Cliques(g,m)` Stops if a maximum of m cliques have been found.
- `Basement(kng,kmg,x)` $n \leq m$
- `AdjMatrix(g)`
- `Adjaceny(g,v)`