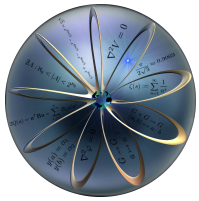

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multigraph

Canonical name	Multigraph
Date of creation	2013-03-22 11:57:57
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Owner	Mathprof (13753)
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Numerical id	8
Author	Mathprof (13753)
Entry type	Definition
Classification	msc 05C75
Synonym	parallel edge
Related topic	Graph
Related topic	Subgraph
Related topic	GraphHomomorphism
Related topic	Pseudograph
Related topic	Quiver
Related topic	AxiomsOfMetacategoriesAndSupercategories

A *multigraph* is a graph in which we allow more than one edge to join a pair of vertices. Two or more edges that join a pair of vertices are called *parallel edges*. Every graph, then, is a multigraph, but not all multigraphs are graphs. Some authors define the concept of a graph by excluding graphs with multiple edges or loops. Then if they want to consider more general graphs the multigraph is introduced. Usually, such graphs have no loops. Formally, a multigraph $G = (V, E)$ is a pair, where $E = (V^{(2)}, f)$ is a multiset for which $f(x, x) = 0$ and $V^{(2)}$ is the set of unordered pairs of V.

A multigraph can be used to a matrix whose entries are nonnegative integers. To do this, suppose that $A = (a_{ij})$ is an $m \times n$ matrix of nonnegative integers. Let $V = S \cup T$, where $S = \{1, \ldots, m\}$ and $T = \{1', \ldots, n'\}$ and connect vertex $i \in S$ to vertex $j' \in T$ with a_{ij} edges.