Discrete Mathematics With Graph Theory 3rd Edition

Girth (graph theory) If the graph does not contain any cycles (that In graph theory, the girth of an undirected graph is the length of a shortest cycle contained in the graph. In graph theory, the girth of an undirected graph is the length of a shortest cycle contained in the graph. If the graph does not contain any cycles (that is, it is a forest), its girth is defined to be infinity 11fde9668d

Incidence matrix The entry in row x and column y is 1 if the vertex x is part of (called incident in this context) the mapping that corresponds to y, and 0 if it is not. Monographs #14, The Mathematical Association of America, p. If the first class is X and the second is Y, the matrix has one row for each element of X and one column for each mapping from X to Y.), Springer-Verlag In mathematics, an incidence matrix is a logical matrix that shows the relationship between two classes of objects, usually called an incidence relation. 99 Diestel, Reinhard (2005), Graph Theory, Graduate Texts in Mathematics, vol. 173 (3rd ed. There are variations; see below 11fde9668d

For example, a 4-cycle (square) has girth 4. A grid has girth 4 as well, and a triangular mesh has girth 3. A graph with girth four or more is triangle-free. 11fde9668d

Complement graph In the mathematical field of graph theory, the complement or inverse of a graph G is a graph H on the same vertices such that two distinct vertices of In the mathematical field of graph theory, the complement or inverse of a graph G is a graph H on the same vertices such that two distinct vertices of H are adjacent if and only if they are not adjacent in G. That is, to generate the complement of a graph, one fills in all the missing edges required to form a complete graph, and removes all the edges that were previously there 11fde9668d

Spectral graph theory In mathematics, spectral graph theory is the study of the properties of a graph in relationship to the characteristic polynomial, eigenvalues, and eigenvectors In mathematics, spectral graph theory is the study of the properties of a graph in relationship to the characteristic polynomial, eigenvalues, and eigenvectors of matrices associated with the graph, such as its adjacency matrix or Laplacian matrix 11fde9668d

Combinatorics is well known for the breadth of the problems it tackles. Combinatorial problems arise in many areas of pure mathematics, notably in algebra, probability theory, topology, and geometry, as well as in its many application areas. Many combinatorial questions have historically been considered in isolation, giving an ad hoc solution to a problem arising in some mathematical context. In the later twentieth century, however, powerful and general... 11fde9668d Graph theory itself is typically dated as beginning with Leonhard Euler's 1736 work on the Seven Bridges of Königsberg. However, drawings of complete bipartite graphs were already printed as early as 1669, in connection with an edition of the works of Ramon Llull edited by Athanasius Kircher. Llull himself had made similar drawings of complete graphs three centuries earlier. 11fde9668d

Graph factorization In particular, a 1-factor is a perfect matching, and a 1-factorization of a k-regular graph is a proper edge coloring with k colors. mathematics In graph theory, a factor of a graph G is a spanning subgraph, i. e. e. A graph G is said to be k-factorable if it admits a k-factorization. , a subgraph that has the same vertex set as G. A k-factor of a graph is a spanning k-regular subgraph, and a k-factorization partitions the edges of the graph into disjoint k-factors. , a subgraph that has the same vertex set as G. A 2-factor is a collection of disjoint cycles that spans all vertices of the graph. A k-factor of a graph is In graph theory, a factor of a graph G is a spanning subgraph, i 11fde9668d

Spectral graph theory is also concerned with graph parameters that are defined via multiplicities of eigenvalues of matrices associated to the graph, such as the Colin de Verdière number. 11fde9668d

Tree (graph theory) A forest is an undirected graph in which any two vertices are connected by at most one path, or equivalently an acyclic undirected graph, or equivalently a disjoint union of trees.

In graph theory, a tree is an undirected graph in which every pair of distinct vertices is connected by exactly one path, or equivalently, a connected In graph theory, a tree is an undirected graph in which every pair of distinct vertices is connected by exactly one path, or equivalently, a connected acyclic undirected graph 11fde9668d

Directed graph In mathematics, and more specifically in graph theory, a directed graph (or digraph) is a graph that is made up of a set of vertices connected by directed In mathematics, and more specifically in graph theory, a directed graph (or digraph) is a graph that is made up of a set of vertices connected by directed edges, often called arcs 11fde9668d

List of unsolved problems in mathematics These problems come from many areas of mathematics, such as theoretical physics, computer science, algebra, analysis, combinatorics, algebraic, differential, discrete and Euclidean geometries, graph theory, group theory, model theory, number theory, set theory, Ramsey theory, dynamical systems, and partial differential equations. Prizes are often awarded for the solution to a long-standing problem, and some lists of unsolved problems, such as the Millennium Prize Problems, receive considerable attention. Some problems belong to more than one discipline and are studied using techniques from different areas. differential, discrete and Euclidean geometries, graph theory, group theory, model theory, number theory, set theory, Ramsey theory, dynamical systems Many mathematical problems have been stated but not yet solved 11fde9668d

Complete bipartite graph In the mathematical field of graph theory, a complete bipartite graph or biclique is a special kind of bipartite graph where every vertex of the first In the mathematical field of graph theory, a complete bipartite graph or biclique is a special kind of bipartite graph where every vertex of the first set is connected to every vertex of the second set 11fde9668d

This list is a composite of notable unsolved problems mentioned in previously published lists, including but not limited to... 11fde9668d A directed tree, oriented tree, polytree, or singly connected network is a directed acyclic graph (DAG) whose underlying undirected graph is a tree. A polyforest (or directed forest or oriented forest) is a directed acyclic graph whose underlying undirected graph is a forest. 11fde9668d

Combinatorics It is closely related to many other areas of mathematics and has many applications ranging from logic to statistical physics and from evolutionary biology to computer science. One of the oldest and most accessible parts of combinatorics is graph theory, which by itself has numerous Combinatorics is an area of mathematics primarily concerned with counting, both as a means and as an end to obtaining results, and certain properties of finite structures. independent branch of mathematics in its own right 11fde9668d

The complement is not the set complement of the graph; only the edges are complemented. 11fde9668d While the adjacency matrix depends on the vertex labeling, its spectrum is a graph invariant, although not a complete one. 11fde9668d The various kinds of data structures referred to as trees in computer science have underlying graphs that are trees in graph theory, although such data structures are... 11fde9668d The adjacency matrix of a simple undirected graph is a real symmetric matrix and is therefore orthogonally diagonalizable; its eigenvalues are real algebraic integers. 11fde9668d