

# Index

This index is arranged strictly in alphabetical order according to the first significant word. Thus, 'edge connectivity' is listed under E and 'k-chromatic graph' under C.

- Acyclic graph, 25
- Adjacency matrix
  - of a digraph, 173
  - of a graph, 7
- Adjacent vertices, edges, 3
- M-alternating path, 70
- M-alternating tree, 81
- Arc, 171
- k-arc-connected digraph, 179
- Associated digraph, 179
- M-augmenting path, 70
- Automorphism, 6
- Automorphism group, 7
- Avoiding bridges, 146
  
- Bandwidth, 248
- Basis matrix, 215
- Basis matrix corresponding to a tree, 216
- Berge's theorem, 80
- Binding number, 249
- Bipartite graph, 4
- Bipartition, 5
- Block, 44
- Block of a graph, 44
- Bond, 29
- Bond space, 213
- Breakthrough, 199
- Bridge, 146
- k-bridge, 146
- Brooks' theorem, 122
- Brouwer's fixed-point theorem, 21
  
- Cage, 236
- Capacity
  - of a cut, 194
  - of an arc, 191
- Capacity function, 191
- Cayley's formula, 32
- Centre, 27
- Chinese postman problem, 62
- k-chromatic graph, 117
- Chromatic number, 117
- Chromatic number of a surface, 243
- Chromatic polynomial, 126
- Chvátal graph, 241
- Circulation, 212
- Clique, 103
- Closed walk, 14
- Closure, 56
- k-colourable graph, 117
- k-colouring, 117
- Complement
  - of a graph, 6
  - of a subgraph, 29
- Complete bipartite graph, 5
- Complete graph, 4
- Complete k-partite graph, 6
- Component, 13
- S-component, 119
- Composition of two graphs, 108
- Condensation, 173
- Conductance matrix, 220
- Connected graph, 13
- k-connected graph, 42
- Connected vertices, 13
- Connectivity, 42
- Connector problem, 36
- Conservation condition, 191
- Contraction of an edge, 32
- Converse, 173
- Cotree, 29
- Covering, 73
- Covering number, 101
- Coxeter graph, 241
- Critical graph, 117
- k-critical graph, 117
- $\alpha$ -critical graph, 103
- $\beta$ -critical graph, 103
- $\kappa$ -critical graph, 47
- Cube, 234
- k-cube, 6
- Cut, 194
- Cut edge, 27
- Cut vertex, 31
- Cycle, 14
- k-cycle, 14
- Cycle space, 212

- Degree
  - of a face, 140
  - of a vertex, 10
- Degree-majorised, 58
- Degree sequence, 11
- Demand, 206
- Diameter, 14
- Diameter of a plane set, 113
- Dicomponent, 172
- Diconnected digraph, 172
- Digraph, 171
- Dijkstra's algorithm, 19
- Dirac's theorem, 54
- Directed cycle, 172
- Directed diameter, 186
- Directed Euler tour, 179
- Directed graph, 171
- Directed Hamilton cycle, 177
- Directed Hamilton path, 174
- Directed path, 172
- Directed tour, 172
- Directed trail, 172
- Directed walk, 171
- Disconnected graph, 13
- Disjoint subgraphs, 9
- Distance
  - in a digraph, 186
  - in a graph, 14
  - in a weighted graph, 16
- Dodecahedron, 234
- Dual, 140
- Duplication of an edge, 63
- Edge, 1
- Edge chromatic number, 91
- $k$ -edge-chromatic graph, 91
- $k$ -edge-colourable graph, 91
- $k$ -edge colouring, 91
- $k$ -edge-connected graph, 42
- Edge connectivity, 42
- Edge covering, 102
- Edge covering number, 102
- Edge cut, 29
- $k$ -edge cut, 42
- Edge-disjoint subgraphs, 9
- Edge graph, 11
- Edge independence number, 102
- Edge-induced subgraph, 9
- Edge-transitive graph, 7
- Embeddable on a surface, 136
- Embedding, 137
- Empty graph, 4
- End, 1
- Equivalent  $k$ -bridges, 146
- Eulerian graph, 51
- Euler's formula, 143
- Euler's theorem, 51
- Euler tour, 51
- Euler trail, 51
- Even component, 76
- Even cycle, 14
- Exterior of a Jordan curve, 135
- Exterior face, 139
- Extremal graph theory, 109
- Face, 139
- Face chromatic number, 158
- $k$ -face-colourable plane graph, 158
- $k$ -face colouring, 158
- $k$ -factor, 71
- $k$ -factorable graph, 71
- Fáry's theorem, 139
- Feasible flow, 206
- Finite graph, 3
- Five-colour theorem, 156
- Fleury's algorithm, 62
- Flow, 191
- Folkman graph, 235
- Forcibly hamiltonian sequence, 248
- Forest, 26
- Four-colour conjecture, 157
- Four-colour problem, 158
- Franklin graph, 244
- Frucht's theorem, 7
- Generalised Ramsey numbers, 109
- Girth, 15
- Good algorithm, 19
- Graceful graph, 248
- Graph, 1
- Graphic sequence, 11
- Gray graph, 235
- Greenwood–Gleason graph, 242
- Grinberg graph, 162
- Grötzsch graph, 118
- Grötzsch's theorem, 159
- Grünbaum graph, 242
- Hadwiger's conjecture, 124
- Hajós' conjecture, 123
- Hall's theorem, 72
- Hamilton cycle, 53
- Hamilton path, 53
- Hamilton-connected graph, 61
- Hamiltonian graph, 53
- Head, 171
- Heawood graph, 236
- Herschel graph, 53
- Hoffman–Singleton graph, 239
- Horton graph, 240
- Hungarian method, 82
- Hypohamiltonian graph, 61
- Hypotracheable graph, 61

- Icosahedron, 234
- Identical graphs, 4
- Improvement of an edge colouring, 92
- Incidence function
  - of a digraph, 171
  - of a graph, 1
- Incidence matrix
  - of a digraph, 214
  - of a graph, 7
- Incident
  - edge with vertex, 3
  - face with edge or vertex, 140
- $f$ -incrementing path, 196
- Indegree, 172
- Independence number, 101
- Independent set, 101
- Induced subgraph, 9
- In-neighbour, 175
- Inner bridge, 148
- Interior of a Jordan curve, 135
- Intermediate vertices, 191
- Internal vertices, 12
- Internally-disjoint paths, 44
- Intersection of graphs, 10
- Isomorphic graphs, 4
- Isomorphism, 4
  
- Join of two graphs, 58
- Joined vertices
  - in a digraph, 171
  - in a graph, 1
- Jordan curve, 135
- Jordan curve theorem, 135
  
- Kirchhoff's current law, 223
- König's theorem, 74
- Kruskal's algorithm, 37
- Kuhn-Munkres algorithm, 87
- Kuratowski's theorem, 153
  
- Labelling method, 198
- Labelling procedure, 198
- Length of walk, 12
- Link, 3
- Loop, 3
  
- Map colour theorem, 244
- Marriage theorem, 73
- Matching, 70
- Matrix-tree theorem, 219
- Max-flow min-cut theorem, 198
- Maximum flow, 192
- Maximum independent set, 101
- Maximum matching, 70
- McGee graph, 237
- Menger's theorems, 46
- Meredith graph, 239
- Minimum covering, 73
- Minimum cut, 195
- Multiplicity, 95
  
- Neighbour set, 72
- Network, 191
- Nontrivial graph, 3
  
- Octahedron, 234
- Odd component, 76
- Odd cycle, 14
- Optimal assignment problem, 86
- Optimal cycle, 65
- Optimal  $k$ -edge colouring, 92
- Optimal matching, 86
- Optimal tour, 62
- Optimal tree, 36
- Order of a squared rectangle, 220
- Order of magnitude of a function, 19
- Orientation, 171
- Origin of a walk, 12
- Outdegree, 172
- Outer bridge, 148
- Out-neighbour, 175
- Overlapping bridges, 146
  
- $k$ -partite graph, 6
- Path, 12
- Perfect graph, 250
- Perfect matching, 70
- Perfect rectangle, 220
- Personnel assignment problem, 80
- Petersen graph, 55
- Petersen's theorem, 79
- Planar embedding, 135
- Planar graph, 135
- Plane graph, 135
- Plane triangulation, 143
- Platonic graphs, 234
- $f$ -positive arc, 195
- Potential difference, 212
- Potentially planar sequence, 251
- Probabilistic method, 107
- Product of graphs, 96
- Proper colouring, 117
- Proper edge colouring, 91
- Proper face colouring, 158
- Proper subgraph, 8
  
- Ramsey graphs, 106
- Ramsey numbers, 104
- Ramsey's theorem, 103
- Reachable vertex, 172
- Reconstruction conjecture, 246
- Rédei's theorem, 175
- Regular graph, 11
- $k$ -regular graph, 11

- Represented (colour at a vertex), 91  
 Resultant flow, 192  
 Revised flow, 197  
 Robbins' theorem, 184  
 Robertson graph, 237  
 Robertson-Wegner graph, 238  
  
 Saturated (vertex by a matching), 70  
 $f$ -saturated arc, 195  
 $f$ -saturated path, 196  
 $M$ -saturated vertex, 70  
 Schur's theorem, 112  
 Section of a walk, 12  
 Self-complementary graph, 6  
 Self-dual plane graph, 142  
 Separated (faces by an edge), 140  
 Shortest path problem, 16  
 Simple graph, 3  
 Simple squared rectangle, 220  
 Sink, 191  
 Skew bridges, 146  
 Source, 191  
 Spanning subgraph, 8  
 Spanning supergraph, 8  
 Spanning tree, 28  
 Sperner's lemma, 22  
 Squared rectangle, 220  
 Stereographic projection, 138  
 Strict digraph, 172  
 Strong perfect graph conjecture, 250  
 Subdigraph, 171  
 Subdivision  
   of a graph, 123  
   of an edge, 45  
 Subgraph, 8  
 Supergraph, 8  
 Supply, 206  
 Surface, 136  
  
 Tail, 171  
 Tait colouring, 159  
 Tait's conjecture, 160  
 Terminus of a walk, 12  
 Tetrahedron, 234  
 Thickness, 145  
 Thomassen graph, 240  
 Tietze graph, 243  
 Timetabling problem, 96  
 Total colouring conjecture, 251  
 Totally unimodular matrix, 220  
 $t$ -tough graph, 249  
  
 Tour, 51  
 Tournament, 174  
 Trail, 12  
 Transfer of a bridge, 149  
 Travelling salesman problem, 65  
 Tree, 25  
 Tree graph, 41  
 Triangle, 14  
 Trivial graph, 3  
 Turán's theorem, 109  
 Tutte-Coxeter graph, 237  
 Tutte graph, 161  
 Tutte's theorem, 76  
 Type 1  $\{u, v\}$ -component, 119  
 Type 2  $\{u, v\}$ -component, 119  
  
 Underlying digraph, 191  
 Underlying graph, 171  
 Underlying simple graph, 8  
 Unilateral digraph, 176  
 Unimodular matrix, 218  
 Union of graphs, 9  
 Uniquely  $k$ -colourable graph, 121  
 Uniquely  $k$ -edge-colourable graph, 96  
 $f$ -unsaturated arc, 195  
 $f$ -unsaturated path, 196  
 $f$ -unsaturated tree, 198  
 $M$ -unsaturated vertex, 70  
  
 Value of a flow, 192  
 Vertex, 1  
 $k$ -vertex-colourable graph, 117  
 $k$ -vertex colouring, 117  
 Vertex cut, 42  
 $k$ -vertex cut, 42  
 Vertex-transitive graph, 7  
 Vertices of attachment, 146  
 Vizing's theorem, 93  
  
 Walk, 12  
 Weight  
   of a subgraph, 16  
   of an edge, 15  
 Weighted graph, 15  
 Wheel, 36  
  
 $f$ -zero arc, 195  
 Zero flow, 192