cycles; if there are no cycles or if all cycles have pseudo length 0, then the index is taken to be 0. Typical results:
(1) If in the graph G each connected component has a cycle whose pseudo-length is not 0, then the set of all stable equivalences on G forms a lattice. (2) If G is a mixed graph each of whose vertices is the endpoint of some directed edge, then the number of connected components of the graph G × H is the greatest common divisor of the index of G and the index of H. The second result was obtained earlier for strongly connected oriented graphs by McAndrew [Proc. Amer. Math. Soc. 14 (1963), 860-866; MR 27 #1932].

G. N. Roney (Storrs, Conn.)

Tutte, W. T. (Waterloo, Ont.)

Halin, Rudolf
Graphen ohne unendliche Wege.
Math. Nachr. 31 (1966), 111-123.
The author characterizes the graphs having no infinite paths. He finds that for a graph to be of this kind it must be decomposable into finite graphs whose intersections satisfy certain specified conditions. Moreover, these conditions exhibit the finite graphs as the vertices of a tree, and this tree must itself have no infinite path.

W. T. Tutte (Waterloo, Ont.)

Harary, Frank; Nash-Williams, C. St. J. A.
On eulerian and hamiltonian graphs and line graphs.
The line graph L(G) is the incidence graph of the edges of G. Additional graphs L_n(G) (n ≥ 2) are defined, and some relationships between Eulerian and Hamiltonian properties of G, L(G), and the graphs L_n(G) are found. The reader may find it helpful to note that L_n(G) = L(L_{n-1}(G)), where L_n(G) is the graph obtained from G by replacing each edge of G by a path consisting of n edges; thus L_n is not the nth iterate of L.

D. W. Walkup (Seattle, Wash.)

Havel, Ivan
On the completeness-number of a finite graph. (Czech and Russian summaries)
The author calls two distinct edges of a graph G quasi-neighbours if they both belong to some complete subgraph of G. He defines a graph G' in which the vertices correspond to the edges of G, and two vertices of G' are joined if and only if the corresponding edges of G are not quasi-neighbours. He shows that the minimum number of complete subgraphs of G whose union is G is equal to the chromatic number of G'.

W. T. Tutte (Waterloo, Ont.)

Hoffman, A. J.; McAndrew, M. H.
The polynomial of a directed graph.
Let G be a directed graph and A the adjacency matrix of G. It is proved that there exists a polynomial P(x) such that P(A) = J (when J is the matrix consisting entirely of 1's) if and only if G is strongly connected and strongly regular. (G is strongly regular if for each vertex i the number of edges with initial vertex i equals the number of edges with terminal vertex i; G is strongly connected if for any vertices i, j (i ≠ j), there is a directed path from i to j.) The unique polynomial of least degree satisfying P(A) = J (called the polynomial belonging to G) is characterized in terms of the minimum polynomial of A.

Does the polynomial belonging to G determine G up to isomorphism? This problem is studied for a particular class of directed graphs. Let t be a positive integer and let G be the graph whose vertices are all ordered pairs (i, j) of residues mod t and whose edges go from (i, j) to (i, j + 1) and (i + 1, j) for all i, j. Let P_t(x) be the polynomial belonging to G. The following theorem is proved: If t is a prime or t = 4 and if H is a graph with t^2 vertices such that P_t(x) belongs to H, then H ≃ G.

J. K. Goldhaber (College Park, Md.)

Troy, D. J.
On traversing graphs.
A covering of a graph G is a cyclic edge sequence S such that consecutive edges in S are different and each edge in G appears exactly twice in S, once in each direction. The main result is that a graph in which all valences satisfy p ≤ 3, and the number of valences with p = 3 is divisible by 4, can have no covering.

O. Ore (New Haven, Conn.)

Walther, H.
Ein kubischer, planarer, zyklisch fünffach zusammenhängender Graph, der keinen Hamiltonkreis besitzt.
A graph is called cyclically n-connected if at least n edges must be deleted in order to separate it into two disjoint parts each of which contains a polygon. It is known that there exist cyclically 3-connected and cyclically 4-connected planar trivalent graphs which are non-Hamiltonian. The author constructs a cyclically 5-connected non-Hamiltonian planar trivalent graph.

W. T. Tutte (Waterloo, Ont.)

Harary, Frank; Palmer, Ed
The number of graphs rooted at an oriented line.
Ist Bul. 4 (1965), 91-93.
Let G be a graph with p points and let H be an induced (possibly oriented) subgraph of G with n points (i.e., a possibly oriented) subgraph which contains all lines of G joining a pair of points in H). None of the lines in the graph G - H is oriented. Let h_{p,q,n} be the number (up to isomorphism) of such graphs G with p points and q unoriented lines. The generating function for these graphs is defined as H_{p}(x) = \sum h_{p,q,n} x^n, where q goes from 0 to (p_a - n) + n(p - n). The main result of the paper is a formula for computing H_{p}(x).

Specifically, H_{p}(x) = \frac{1}{2} (f(H) - S_{p-1} + x), where f(H) is the automorphism group of the oriented graph H, S_{p-1} is the symmetric group of degree p - 1, and Z(·) is the cycle index of (·).

Leonard Weiss (Providence, R.I.)

Harary, Frank; Palmer, Ed
Enumeration of mixed graphs.
A mixed graph is defined as a graph whose edges may be oriented or nonoriented. The problem is to derive an expression for the number m_{p,q,r} of mixed graphs on p