BULL. AUSTRAL. MATH. SOC. MOS 20E10
VOL. 5 (1971), 283-284.

Abstracts of Australasian Ph.D. theses

Laws in torsion-free nilpotent varieties with particular reference to the laws of free nilpotent groups

Paul Pentony

In this thesis I am concerned largely with the varieties of groups generated by the free-nilpotent-of-class-c groups of rank $n < c$, that is $\mathrm{Var}\left(F_n(\underline{\underline{N}}_c)\right)$.

I show that, if $n > \max\left\{\frac{c-1}{2}, 8\right\}$,

(1) $$\mathrm{Var}\left(F_n(\underline{\underline{N}}_c)\right) \wedge \underline{\underline{N}}_{c-1} = \mathrm{Var}F_{n+1}(\underline{\underline{N}}_{c-1})$$

but that (1) is not true if $n = \frac{c}{2} - 2$.

In the process of proving this I obtain, for each $w < c-1$, a set of commutator words which are homogeneous of weight $c - w$, include all the laws of weight $c - w$ in $F_{n+w}(\underline{\underline{N}}_{c-w})$ and are all laws in $F_n(\underline{\underline{N}}_c)$.

This proves that

$$\left(\left(\mathrm{Var}F_n(\underline{\underline{N}}_c)\right) \wedge \underline{\underline{N}}_{c-w}\right) \vee \underline{\underline{N}}_{c-w-1} \subseteq \mathrm{Var}\left(F_{n+w}(\underline{\underline{N}}_{c-w})\right) \vee \underline{\underline{N}}_{c-w-1} .$$

These results rely on a relationship between certain nilpotent varieties and representations of general linear groups. The relationship was first pointed out by Higman [1] for varieties of prime exponent and has subsequently been extended by Kovács and Newman to varieties generated by torsion free groups. Since Kovács and Newman's work is as yet unpublished

Received 17 May 1971. Thesis submitted to the Australian National University, December 1970. Degree approved, February 1971. Supervisor: Dr M.F. Newman.

the thesis contains an exposition of this extension.

Reference

[1] Graham Higman, "Representations of the general linear groups and varieties of p-groups", *Proc. Internat. Conf. Theory of groups, Austral. Nat. Univ., Canberra*, (1965), 167-173 (Gordon and Breach, New York, London, Paris, 1967).