A Proof from PROTEIN*

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October 10, 1996

Abstract

This is just an experiment.

Axiom 0.1 $p(A) \vee p(f^2(A))$.

Theorem 0.1 $\exists\ x_1\ (p(x_1) \wedge p(f(x_1)))$.

Proof[1]. We show directly that

$$\exists\ x_1\ (p(x_1) \wedge p(f(x_1))). \tag{1}$$

Let us consider an arbitrary v_1. We distinguish specific cases depending on $p(f^2(v_1))$.

Let us assume that

$$\neg\ p(f^2(v_1)). \tag{2}$$

Hence by Axiom 0.1

$$p(v_1). \tag{3}$$

We distinguish specific cases depending on $p(f^3(v_1))$.

Let us assume that $\neg\ p(f^3(v_1))$. Hence by Axiom 0.1 $p(f(v_1))$. Hence by (3) we see that $A = v_1$ is a solution.

Let us assume that

$$p(f^3(v_1)). \tag{4}$$

We distinguish specific cases depending on $p(f^2(v_1))$.

*This manuscript was generated by ILF. The development of ILF was supported by the Deutsche Forschungsgemeinschaft. For information on ILF contact gehne@mathematik.hu-berlin.de.

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By Axiom 0.1 and by (2) $p(f^4(v_1))$. Hence by (4) we see that $A = f^3(v_1)$ is a solution.

Let us assume that $p(f^2(v_1))$. Hence by (4) we see that $A = f^2(v_1)$ is a solution.

Thus we have completed all cases for $p(f^2(v_1))$.

Thus we have completed all cases for $p(f^3(v_1))$.

Let us assume that

$$p(f^2(v_1)). \tag{5}$$

We distinguish specific cases depending on $p(f(v_1))$.

Let us assume that $\neg\ p(f(v_1))$. Hence by Axiom 0.1 $p(f^3(v_1))$. Hence by (5) we see that $A = f^2(v_1)$ is a solution.

Let us assume that $p(f(v_1))$. Hence by (5) we see that $A = f(v_1)$ is a solution.

Thus we have completed all cases for $p(f(v_1))$.

Thus we have completed all cases for $p(f^2(v_1))$.
This completes the proof of (1).

q.e.d.