Meeting: 1006, Lubbock, Texas, SS 7A, Special Session on Topology of Dynamical Systems

1006-37-183 **Anatoly B. Korchagin*** (korchag@math.ttu.edu), Department of Mathematics and Statistics, Texas Tech University, Lubbock, TX 79409-1042. *On equations of compound and simple limit cycles.*

In this talk we discuss a connection between the 1st and 2nd parts of Hilbert's 16th problem. We discuss possible equations of limit cycles and give answers on the following two questions.

1) Let $H : \mathbb{R}^2 \to \mathbb{R}^1$ be a real analytic function. Let $L^c = \{(x, y) \in \mathbb{R}^2 | H = c\}$ with $c \in \mathbb{R}^1$ be a level of the function H. Let C be a compact connected component of the level L^c (in particular, diffeomorphic to the standard circle). What is an ordinary differential equation, for which the component C is a compound limit cycle (in particular, a limit cycle)? An answer for this question is the ordinary differential equation

$$[H_x + \beta(y - b)(H - c)^m \xi_1(H)]dx + [H_y + \alpha(x - a)(H - c)^n \eta_1(H)]dy = 0.$$

2) Let an analytic vector field (P, Q), defined in a domain $D \subset \mathbb{R}^2$, have a compound limit cycle or limit cycle C. Let $H(x, y) = 0$ be an (unknown) equation of the cycle C. What is a partial differential equation, for which the function $H(x, y)$ is a solution? An answer for this question is the partial differential equation

$$P[H_x + \beta(y - b)(H - c)^m \xi_1(H)] + Q[H_y + \alpha(x - a)(H - c)^n \eta_1(H)] = 0.$$

Under certain conditions on the field (P, Q), we give a method of solution of the last equation. (Received February 14, 2005)