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Phase portraits of piecewise linear continuous differential systems with two zones separated by a straight line

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Abstract

This paper provides the classification of the phase portraits in the Poincaré disc of all piecewise linear continuous differential systems with two zones separated by a straight line having a unique finite singular point which is a node or a focus. The sufficient and necessary conditions for existence and uniqueness of limit cycles are also given.

MSC: 34C37; 34C07; 37G15

Keywords: Phase portraits; Piecewise linear differential system; Limit cycle

1. Introduction and statement of the main results

The Liénard second order differential equation

$$\ddot{x} + f(x)\dot{x} + g(x) = 0, \tag{1}$$

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