# Notes on dynamical systems and their applicability in semantic analysis

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In physics *dynamical system* is described as:

*An ensemble of particles whose state varies over time and obeys equations of evolution involving derivatives. The evolution of the whole system is dictated by the solution of the equations of the evolution of the system.*

To be a bit more precise we recognize that dynamical system includes the following concepts:

1. The concept of *Phase Space* , whose elements or “points” represent possible states of the system
2. The concept of *Time* which may be discrete or continuous. It may extend either only in the future (irreversible or noninvertible processes) or into the past as well as the future (reversible / invertible processes). The sequence of time moments for a reversible discrete-time process is in a natural correspondence to the set of all integers; irreversibility corresponds to considering only nonnegative integers. For continuous-time processes, time is represented by the set of all real numbers in the reversible case and by the set of nonnegative real numbers for the irreversible case
3. *Equations of evolution*. Most generally, this is a rule that allows us to determine the state of the system at each moment of time t from its states in all previous times.