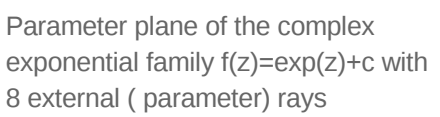
Exponential map (discrete dynamical systems)

In the theory of dynamical systems, the **exponential map** can be used as the evolution function of the discrete nonlinear dynamical system.[1]

Family

The family of exponential functions is called the **exponential family**.

Forms



Parameter plane of the complex exponential family f(z)=exp(z)+c with 8 external (parameter) rays

There are many **forms** of these maps,[2] many of which are equivalent under a coordinate transformation. For example two of the most common ones are:

- $E_c : z \to e^z + c$
- $E_\lambda : z \to \lambda * e^z$

The second one can be mapped to the first using the fact that $\lambda * e^z . = e^{z+ln(\lambda)}$, so $E_\lambda : z \to e^z + ln(\lambda)$ is the same under the transformation $z = z + ln(\lambda)$. The only difference is that, due to multi-valued properties of exponentiation, there may be a few select cases that can only be found in one version. Similar arguments can be made for many other formulas.

References

1. Dynamics of exponential maps by Lasse Rempe (http://macau.uni-kiel.de/receive/dissertation_diss_00000781)
2. (http://front.math.ucdavis.edu/0805.1658)Lasse Rempe, Dierk Schleicher : Bifurcation Loci of Exponential Maps and Quadratic Polynomials: Local Connectivity, Triviality of Fibers, and Density of Hyperbolicity