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Homoclinic orbits for the limiting case of the Mackey–Glass equation

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We consider the Mackey–Glass equation and let $n \to \infty$ to obtain the limiting case, namely,

$$x'(t) = -ax(t) + bf(x(t-1)), \tag{1}$$

where $f(\xi) = \xi$ for $\xi \in [0, 1)$, $f(1) = 1/2$, and $f(\xi) = 0$ for $\xi > 1$.

In a previous work, we established the existence of *complicated* looking, orbitally asymptotically stable periodic orbits for (1) utilizing rigorous numerics. Now, we present how those techniques can be extended to localize an unstable periodic orbit p and show the existence of a homoclinic orbit to p.

This is a joint work with Gabriella Vas and Tibor Krisztin.