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On Unbounded Solutions for Differential Equations with Mean Curvature Operator

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We present necessary and sufficient conditions for the existence of unbounded increasing solutions for nonlinear differential equations with mean curvature operator

$$\big(a(t)\Phi_E(x')\big)' + b(t)F(x) = 0,$$

where Φ_E denotes the Euclidean mean curvature operator

$$\Phi_E(u) = \frac{u}{\sqrt{1+u^2}}\ .$$

We use a fixed point result for operators defined in a Fréchet space, which does not require the explicit form of the fixed point operator and reduces the solvability of a boundary value problem for nonlinear equations to the solvability of an associated boundary value problem for a linear equation.

The results illustrate the asymptotic proximity of such solutions with those of an auxiliary linear equation on the threshold of oscillation. A new oscillation criterion for equations with mean curvature operator, extending Leighton criterion for linear Sturm-Liouville equation, is also derived.

This is the joint work with Mauro Marini and Serena Matucci (University of Florence).