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18.306 Advanced Partial Differential Equations with Applications
Fall 2009

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Lecture 15 2009 10 28 WED

Topics: Hyperbolicity and weak singularities.

Examples: Hamilton-Jacobi equation and characteristic form.
Eikonal equation. Multiple values.

Continue with lecture 14, and examples.

Example: equation $H(u, p, q, x, y) = 0$, where $p = u_x$ and $q = u_y$.
Can singularities propagate in this equation?

Yes, on second derivatives.

Derive equation for locus of singularities, this gives an
ode for x and y in terms of the solution [rays].

Complete rays to full set of characteristic equations,
for $[x, y, p, q$ and $u]$.

Example: Derive Eikonal equation and write characteristics.

Geometrical interpretation of the characteristic solution.

Issue: rays can cross, leading to multiple values. Will investigate
this in what follows.