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18.306 Advanced Partial Differential Equations with Applications
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TOPICS: pde and propagation of information.
Equations that allow weak singularities.
Examples.

How to send "information" via an equation: Insert "singularity" in equation. If the singularity is propagated by the equation, can use this to send information (Alphabet with singularity type encoding "letters").

Works only if the equation allows singularities to propagate.
Basically: Hyperbolic equations are equations with this property.

Implementation:

Singularities must be "weak", so the equation makes sense even with them (i.e.: they appear in some sufficiently high order derivative).
The curve/surface/whatever in space-time where the singularity appears is a characteristic.

Examples: Linear 1st order equations.
Semilinear and quasi-linear equations.
Rederive characteristics from this approach.