

Preliminary Examination: Partial Differential Equations,
10:00 AM - 1:00 PM, Jan. 14, 2013,
Rooms KOBL 350 and KOBL 355.

Name: _____

There are 5 problems. **Do problems 1, 2 and 3, and choose one between problems 4 and 5.** Each problem is worth 25 points. A sheet of convenient formulae is provided.

| # | possible | score |
|-------|----------|-------|
| 1 | 25 | |
| 2 | 25 | |
| 3 | 25 | |
| 4 | 25 | |
| 5 | 25 | |
| Total | 100 | |

- (a) State and prove the Riemann-Lebesgue Lemma.
(b) Assume $f(x) : [-$,

3. Let a curve be defined by $(\hat{x}) = \{(x, t) \in \mathbb{R}^2 / t = -x \text{ and } x \in \hat{x}\}$ and consider the partial differential equation for $u(x, t)$ with initial conditions on this curve:

$$\begin{aligned} -\frac{u}{t} + t\frac{u}{x} &= u, & t &= -x, \\ u(s, -s) &= \sin(s), & s &= -ss \end{aligned} \tag{4}$$