

# Global Exercise - 15

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## 1 Monotone $\rightarrow L_1$ -Contracting $\rightarrow$ TVD $\rightarrow$ Mon.Pre.

Example 1. *abc*

## 2 Total variation diminishing (TVD)

Example 2. *abc*

## 3 Limiter

Example 3. *abc*

## 4 Review Riemann's problem and Godunov's solver

Example 4. *abc*

Roe's solver:  
P.L.Roe [1981], [Approximate Riemann solvers, parameter vectors, and difference schemes](#).

**Example 5.** Examine  $u_L > u_R$ .

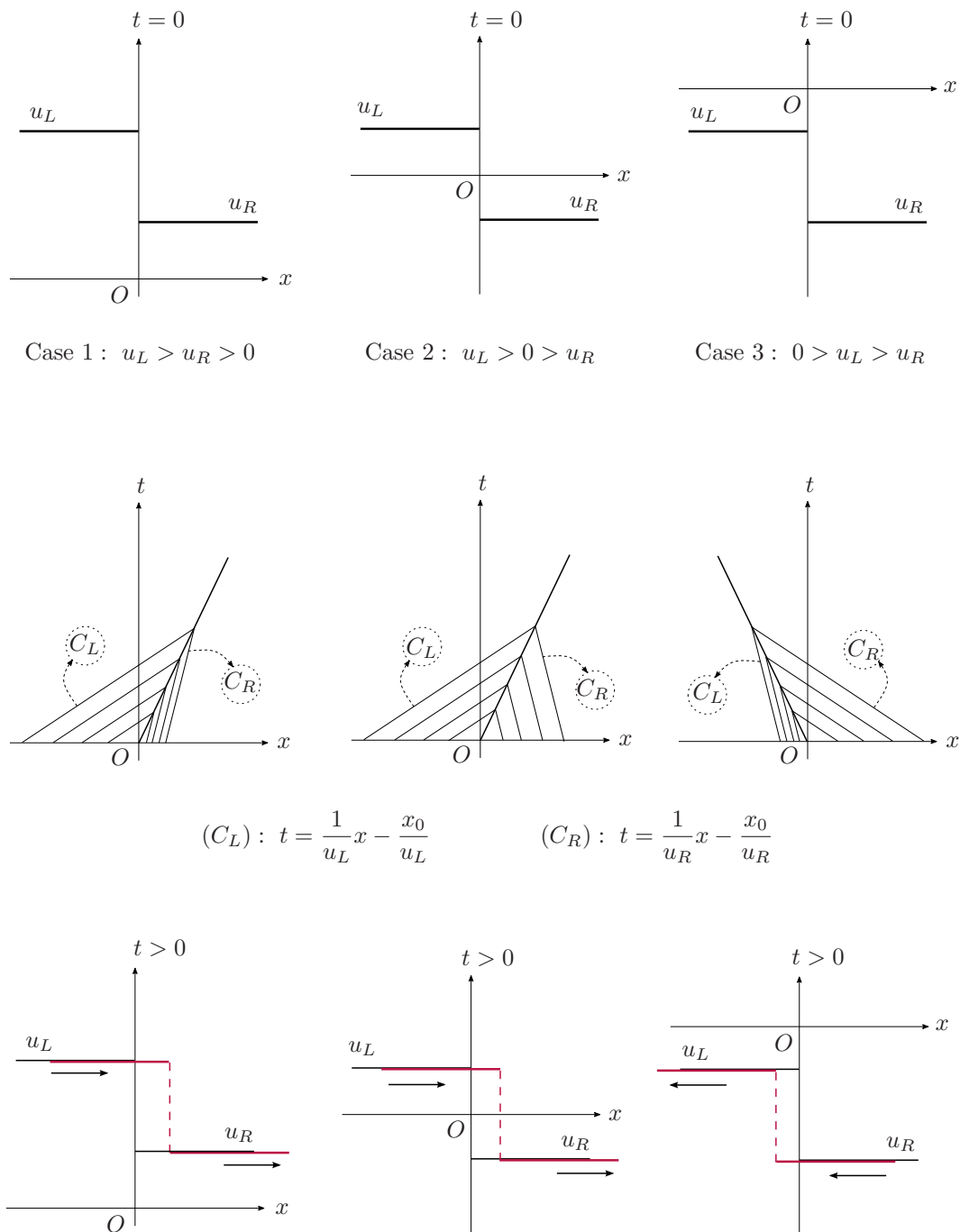
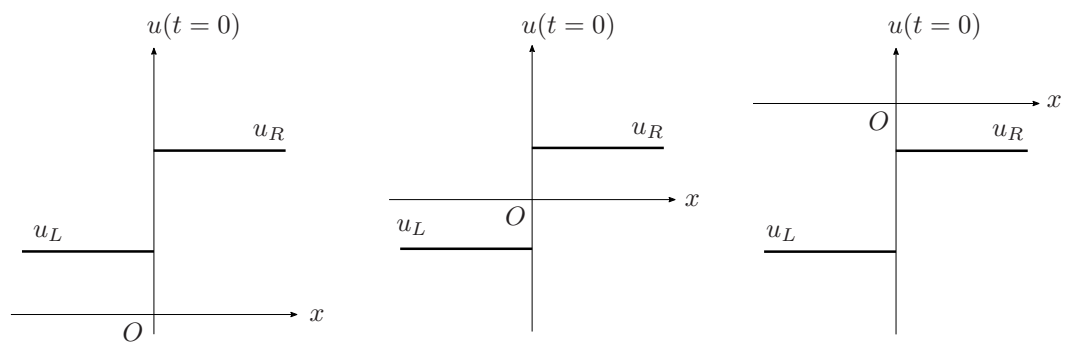


Figure 1: Riemann problem with  $u_L > u_R$ : IC, Characteristics, Solution.

Schock solution

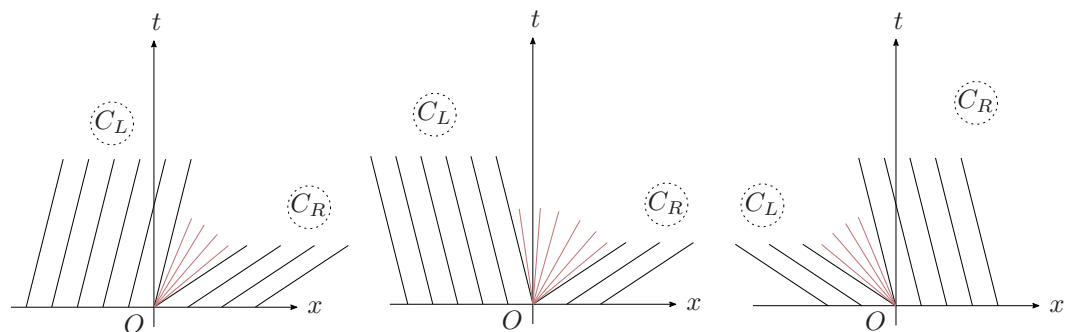
**Example 6.** Examine  $u_L < u_R$ .



Case 1 :  $0 < u_L < u_R$

Case 2 :  $u_L < 0 < u_R$

Case 3 :  $u_L < u_R < 0$



$$(C_L) : t = \frac{1}{u_L}x - \frac{x_0}{u_L}$$

$$(C_R) : t = \frac{1}{u_R}x - \frac{x_0}{u_R}$$

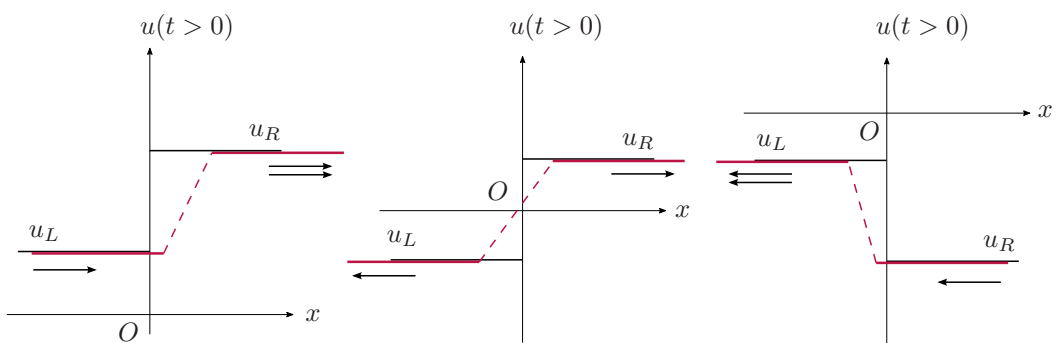


Figure 2: Riemann problem with  $u_L < u_R$ : IC, Characteristics, Solution.

Rarefaction solution