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Modern amplitude techniques

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Abstract: Notes on modern amplitude techniques written as part of a research project with Jaroslav Trnka.

Contents

1 Problem 1

We will take the rotated null coordinates given by,

$$\begin{aligned} u &= t - x & v &= t + x \\ U &= \operatorname{atan} u & V &= \operatorname{atan} v \\ T &= V + U, & X &= V - U \end{aligned} \tag{1.1}$$

Which combined give

$$T = \operatorname{atan}[t + x] + \operatorname{atan}[t - x], \qquad X = \operatorname{atan}[t + x] - \operatorname{atan}[t - x] \tag{1.2}$$

2 Problem 2

We will take the rotated null coordinates given by,

$$\begin{aligned} u &= t - x & v &= t + x \\ u' u & & V &= \operatorname{atan} v \\ T &= V + U, & X &= V - U \end{aligned} \tag{2.1}$$

Which combined give

$$T = \operatorname{atan}[t + x] + \operatorname{atan}[t - x], \qquad X = \operatorname{atan}[t + x] - \operatorname{atan}[t - x] \tag{2.2}$$