

# Covering Rectangles of Real Function Preimages

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**Abstract.** Carrying out abstract interpretation at runtime requires space-efficient domains with time-efficient operations.  
probabilistic programming language whose runtime carries out both forward and backward analysis to constrain  
compute sound overapproximations of image sets and preimage sets  
obvious how to compute preimage covers under single-argument, monotone real functions, and how to extend to piecewise monotone functions:  
use bijections  
not obvious how to compute preimage covers under multi-argument, monotone real functions such as addition, nor is it obvious how to extend  
to multi-argument, piecewise monotone functions such as multiplication  
need a generalization of bijections  
extend the cyclic group structure of bijections to functions with more arguments, yielding trijections, quadjections, and more generally polyjections  
efficiently compute sound, rectangular approximations of preimages under bijections such as log/exp, log1p/expm1, sqr/sqrt, trijections such as arithmetic operators and pow, and polyjections such as summation  
add rich real function support to probabilistic language; use it to probabilistically verify error bounds of floating-point functions

**Keywords:**

## 1 Introduction

Citing something so BibTeX won't complain: [1]

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## References

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