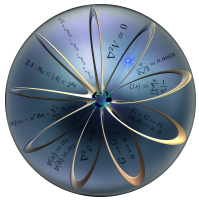

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search problem

Canonical name	SearchProblem
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Defines	calculate

If R is a binary relation such that field$(R) \subseteq \Gamma^+$ and T is a Turing machine, then T *calculates* f if:

- If x is such that there is some y such that $R(x, y)$ then T accepts x with output z such that $R(x, z)$ (there may be multiple y, and T need only find one of them)
- If x is such that there is no y such that $R(x, y)$ then T rejects x

Note that the of a partial function is a binary relation, and if T calculates a partial function then there is at most one possible output.

A R can be viewed as a *search problem*, and a Turing machine which calculates R is also said to solve it. Every search problem has a corresponding decision problem, namely $L(R) = \{x \mid \exists y R(x, y)\}$.

This definition may be generalized to n-ary relations using any suitable encoding which allows multiple strings to be compressed into one string (for instance by listing them consecutively with a delimiter).