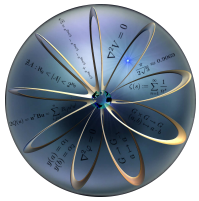

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decision problem

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Defines	enumerates
Defines	decide

Let T be a Turing machine and let $L \subseteq \Gamma^+$ be a language. We say T *decides* L if for any $x \in L$, T accepts x, and for any $x \notin L$, T rejects x.

We say T *enumerates* L if:

$$x \in L \text{ iff } T \text{ accepts } x$$

For some Turing machines (for instance non-deterministic machines) these definitions are equivalent, but for others they are not. For example, in order for a deterministic Turing machine T to decide L, it must be that T halts on every input. On the other hand T could enumerate L if it does not halt on some strings which are not in L.

L is sometimes said to be a *decision problem*, and a Turing machine which decides it is said to solve the decision problem.

The set of strings which T accepts is denoted $L(T)$.