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range problem

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Defines	strong range problem
Defines	strong range

A *range problem* is a weakened form of a search problem. It consists of two functions f_l and f_u (the lower and upper bounds) and a linear ordering $<$ on the ranges of f_1 and f_2. A Turing machine solves a range problem if, for any x, the machine eventually halts with an output y such that $f_1(x) < y < f_2(x)$.

For example, given any function f with range in $\mathbb{R}$ and any $g : \mathbb{N} \to \mathbb{R}$, the *strong range problem* StrongRange$_g(f)$ is given by lower bound $f(x) \cdot (1 - \frac{1}{1-g(|x|)})$ and upper bound $f(x) \cdot (1 - \frac{1}{1+g(|x|)})$ (note that g is passed the length of x, not the value, which need not even be a number).