original question

Is it impossible to know if two functions are equivalent? For example, a compiler writer wants to determine if two functions that the developer has written perform the same operation, what methods can he use to figure that one out? Or can what can we do to find out that two TMs are identical? Is there a way to normalize the machines?

Edit: If the general case is undecidable, how much information do you need to have before you can correctly say that two functions are equivalent?

accepted as best answer

Given an arbitrary function, *f*, we define a function *f'* which returns *1* on input *n* if *f* halts on input *n*. Now, for some number *x* we define a function *g* which, on input *n*, returns *1* if *n* = *x*, and otherwise calls f'(n).

If functional equivalence were decidable, then deciding whether *g* is identical to *f'* decides whether *f* halts on input *x*. That would solve the Halting problem. Related to this discussion is Rice's theorem.

Full conversation thread