

# Recursion Theory

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- Gödel numbers!



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- What are TM's? : list of instructions over some language

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- Long live the Church Turing Thesis!



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- Another fact about code of programs: Every p.c. function has infinitely many different codes (Padding Lemma)

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 $f(x, y) = \varphi_{g(x)}(y)$ .
- More general: for each  $m, n \in \mathbb{N}$ , there is a function  $S_n^m$  such that

$$\varphi_e^{m+n}(x_1, \dots, x_m, y_1, \dots, y_n) = \varphi_{S_n^m(e, x_1, \dots, x_m)}(y_1, \dots, y_n)$$

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- $f \circ h$  has code  $e$ , that is,  $(f \circ h)(x) = \varphi_e(x)$
- So, we can take  $k$  to be  $h(e)$  (here we use that  $h$  should be total!)

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