PS07-01

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Proof. Let $P_1 = \{x \in \{1\}^* : x \notin L(M_x)\}$
Suppose K is a total TM for P_1. $L(K) = P_1$.
Let $w = [K]$

$$\begin{aligned} w \in P_1 &\Leftrightarrow w \notin L(M_w) && \text{(def of } P_1\text{)} \\ &\Leftrightarrow w \notin L(K) && \text{(def of } w\&K\text{)} \\ w \in P_1 &\Leftrightarrow w \notin P_1 && \text{(def of } K\text{)} \end{aligned}$$

A contradiction! □