

# Computability Assignment

## Year 2012/13 - Number 9

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### 1 Question

Assume that  $f$  is a recursive partial function satisfying the following property:

$$\forall n, m \in \mathbb{N}. f(2^n 3^m) = \begin{cases} m + 1 & \text{if } \phi_n(m) = 0 \\ 0 & \text{otherwise} \end{cases}$$

(Note that the above makes no guarantees on e.g. what  $f(7)$  actually is).

Prove that:

1. The set  $A = \{n \mid \phi_n(5 \cdot n) = 0\}$  is recursive.
2. (Harder, feel free to skip it)  
The set  $B = \{n \mid \phi_n(2) = 5\}$  is recursive.

(Note: actually  $f$  is a non recursive function, and  $A, B$  are non recursive sets. Still, I'm interested in how one proves the above portion of a reduction argument.)

#### 1.1 Answer

Write your answer here.