

Assignment - 3 (Due: 27 October 2015) :

Renewed on request to: 30th October 2015

The purpose of this assignment is to see the power of a TM: its capability to compute any numerical function also recognize languages.

- Choose (i) a function AND (ii) a language from [8 - 17] and construct TMs for the same.
- Construct TMs for numerical functions for both the cases: (a) unary alphabet and (b) binary alphabet from first principles.
- Also if you assume the basic machines as Shift Right, Shift Left, Copy, Reverse etc, show how your TM can be modified. Explain your ideas clearly.

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1. 2^n ,
 2. n^2 ,
 3. $f(x, y) = x + y$,
 4. $f(x, y) = x - y$,
 5. $f(x) = x^2$,
 6. $f(x) = |x|$,
 7. $f(x) = x * y$,
 8. $L = \{a^n b^m a^m b^n : m, n \geq 0\}$
 9. $\{x a y b : x, y \in \{a, b\}^* \text{ and } |x| = |y|\}$

10. $\{a^i b^j c^k : j = i + k\}$
11. $\{a^i b^j c^k : i < j \text{ or } i > k\}$
12. $\{a^i b^j : i \leq 2j\}$
13. $\{a^i b^j : i \leq j \leq 2i\}$
14. $W = \{w a^{\text{length}(w)} : w \in \{a, b\}^*\}$
15. $\{w \# x | w^R \text{ is a substring of } x; w, x \in \{a, b\}^*\}$
16. $\{a^i b^j c^k : j = i \text{ or } j = k\}$
17. The set of strings with twice as many a's as b's.