

Sample Assignment # 9.1

1. Use quantification of an algorithmic predicate to estimate the complexity (decidable, re, co-re, non-re) of each of the following, (a)-(d):
 - a) REPEATS = { f | for some x and y , $x \neq y$, $f(x) \downarrow$, $f(y) \downarrow$ and $f(x) == f(y)$ }
 - b) DOUBLES = { f | for all x , $f(x) \downarrow$, $f(x+1) \downarrow$ and $f(x+1) = 2 * f(x)$ }
 - c) DIVEVEN = { f | for all x , $f(2 * x) \uparrow$ }
 - d) QUICK10 = { f | $f(x)$, for all $0 \leq x \leq 9$, converges in at most $x+10$ steps }

Assignment # 9.2

2. Let sets **A** be recursive (decidable) and **B** be re non-recursive (undecidable).

Consider **$C = \{ z \mid \min(x,y), \text{ where } x \in A \text{ and } y \in B \}$** . For (a)-(c), either show sets **A** and **B** with the specified property or demonstrate that this property cannot hold.

- a) Can **C** be recursive?
- b) Can **C** be re, non-recursive?
- c) Can **C** be non-re?