

# Assignment # 9.1a Key

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 # 9.21 Key

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?