Choosing from among (REC) recursive, (RE) re non-recursive, (coRE) co-re non-recursive, (NRNC) non-re/non-co-re, categorize each of the sets in a) through d). Justify your answer by showing some minimal quantification of some known recursive predicate.

a.) \{ f | \text{domain}(f) \text{ is infinite} \}

NRNC

Justification: \( \forall x \exists y,t > [ y \geq x \& \STP(f,y,t) ] \)

b.) \{ f | |\text{range}(f)| = 1 \}

NRNC

Justification: \( \exists x,t \forall y,t' > [ \STP(f,x,t) \& \& \\
(\STP(f,y,t') \Rightarrow (\VALUE(f,y,t') = \VALUE(f,x,t))) ] \)

c.) \{ <f,x> | f(x) \text{ converges in at most } 2^x+1 \text{ steps} \}

REC

Justification: \( \STP(f, x, 2^x+1) \)

d.) \{ f | \text{domain}(f) \text{ converges in at most } 2^x+1 \text{ steps for all input } x \}

coRE

Justification: \( \forall x \STP(f, x, 2^x+1) \)