Assignment#2; Due January 28 at start of class

Let set **A** be non-empty recursive, **B** be re non-recursive and **C** be non-re. Using the terminology **(REC) recursive**, **(RE) non-recursive recursively enumerable**, **(NR) non-re**, categorize each set below, saying whether or not the set can be of the given category and justifying each answer. You may assume, for any set **S**, the existence of comparably hard sets
S_E = **{2x|x∈S}** and S_D = **{2x+1|x∈S}**. The following is a sample of the kind of answer I require:

Sample.) $A \cap C = \{ x \mid x \in A \text{ and } x \in C \}$

REC: Yes. If A = {0} then A ∩ C = ∅ ot {0}, each of which is in REC.

RE: Yes. Let A = $\aleph_E$ = { 2x | x ∈ ℵ }; let C = $TOT_D \cup HALT_E$ then A ∩ C = $HALT_E$ which is in RE

NR: Yes. If A = ℵ then A ∩ C = C, which is in NR.

a.) $B - A = \{ x \mid x \in B \text{ and } x \notin A \}$ **// Set difference**

b.) $A * B = \{ x * y \mid x \in A \text{ and } y \in B \}$ **// Multiplication**

c.) $A \cup C = \{ x \mid x \in A \text{ or } x \in C \}$ **// Set union**

Be careful: Some may not be possible. If so, you must justify why this is so.

Note:
$TOT = \{ x \mid \forall \varphi_x (y) \downarrow \}$. These are the indices of the set of algorithms.
$HALT = \{ \langle x,y \rangle \mid \varphi_x (y) \downarrow \}$. This is the set of pairs of procedures and input for which the given procedure halts.

The set S_E for any set S is defined as $\{2x \mid x \in S \}$
$S_D = \{ 2x+1 \mid x \in S \}$.