DISCRETE MATH MAR 16 (RELATIONS)

(1) Consider a relation $R = \{(a, a), (a, b), (b, c), (a, c)\}$ on $A = \{a, b, c\}$. Which is it? (choose all that apply)

   (a) Reflexive
   (b) Symmetric
   (c) Transitive
   (d) Antisymmetric

   ANSWER: (c) and (d)

(2) Which of the following pairs are NONCOMPARABLE in the poset $(\{\text{sets}\}, \subseteq)$? (choose all that apply)

   (a) $\{2, 3\}$ and $\mathbb{Z}$
   (b) $\emptyset$ and $\mathbb{C}$
   (c) $\{1, 2, 3\}$ and $\{1, 3\}$
   (d) $[0, 5]$ and $[3, 9]$
   (e) $\{\text{odds}\}$ and $\{\text{multiples of } 3\}$

   ANSWER: (d) and (e)

(3) Suppose we declare two letters of our alphabet to be related if they have the same number of straight line segments in the standard way that they appear on a computer keyboard. So for instance $\mathsf{Z} \sim \mathsf{Y} \sim \mathsf{K} \sim \mathsf{A} \sim \mathsf{F} \sim \mathsf{H} \sim \mathsf{N}$ and $\mathsf{Q} \sim \mathsf{I} \sim \mathsf{B}$.

   Here is the alphabet for reference:
          QWERTYUIOPASDFGHJKLZXCVBNM
   Which of the following are true? (choose all that apply)

   (a) There are 5 blocks in the associated partition.
   (b) $\sim$ is a partial order as well as an equivalence relation.
   (c) $\{\mathsf{Y}, \mathsf{Z}\} \subseteq [\mathsf{H}]$
   (d) $[\mathsf{M}] \cap [\mathsf{D}] = \emptyset$
   (e) $[\mathsf{B}] = 1$

   ANSWER: (a), (c), (d)