WORKSHOP 19: §9.1-9.3 MARCH 28, 2017

Name: _____

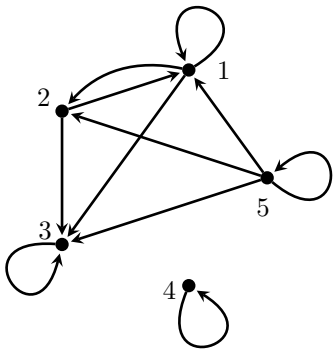
(1) Let $A = \{$a,e,i,o,u$\}$ and

$Z = \{$abiu, cosmos, footfall, mercurial, oversocialized, precarious, retrograde, syzygy, thank$\}$.

Define the relation R from A to Z by xRw if (and only if) x appears in w.
   (a) Treating R as a set, write the first few elements.
   (b) Draw the arrow diagram for R.
   (c) Is R a function?
   (d) Define $f \subseteq R$ by $f = \{(x, w) : w$ is alphabetically the first word of Z that contains $x\}$. Is f a function from A to Z? Is it injective? Surjective?
   (e) Define $g : A \to \mathcal{P}(Z)$ by $g(x) = \{w \in Z : xRw\}$. Is g injective? Surjective?

(2) Let S be the relation on $\mathbb{Z}^+$ with aSb if and only if $a \mid b$.
   (a) Which of the following are true: $2S4$, $4S2$, $4S4$
   (b) Draw the arrow diagram for S restricted to the set $\{1, 2, 5, 6, 7, 12, 30, 84\}$.
   (c) Is S reflexive? Is it anti-reflexive?
   (d) Is S symmetric? Is it anti-symmetric?
   (e) Is S transitive?

(3) Here is (the arrow diagram of) a relation T on a finite set:



   (a) Is T reflexive? Anti-reflexive?
   (b) Is T symmetric? Anti-symmetric?
   (c) Is T transitive?

(4) Describe the relations that are both symmetric and anti-symmetric. (Yes, there are some.)

(5) Are there any relations that are both reflexive and anti-reflexive?