Chapter 4: Functions and Relations (40%)

Calculating function compositions (5%)

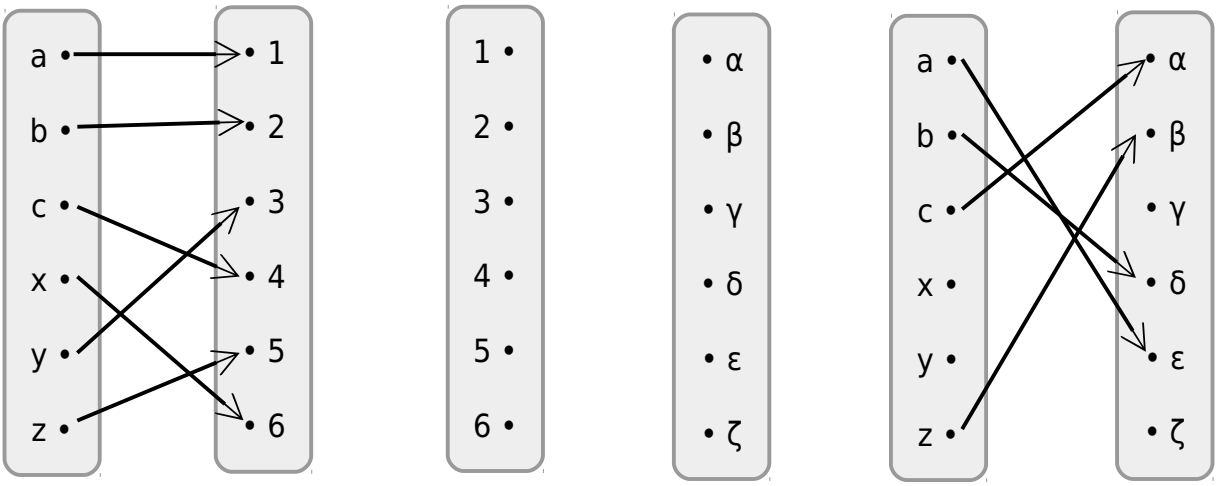
For the given functions, find the following:

$f(x)=2x-1$ And $g(x)=3x$, with the domain and codomain both being $\mathbb{Z}$.

Composition arrow diagrams (5%)

_____ Fill in the missing arrow diagram.

f g $g \circ f$



Function properties (5%)

Fill in the blank for the following statements.

_____ (a) A function is _____ if every point in the codomain has an arrow ending at that point.

_____ (b) A function is _____ if no point in the codomain has two or more arrows ending at that point.

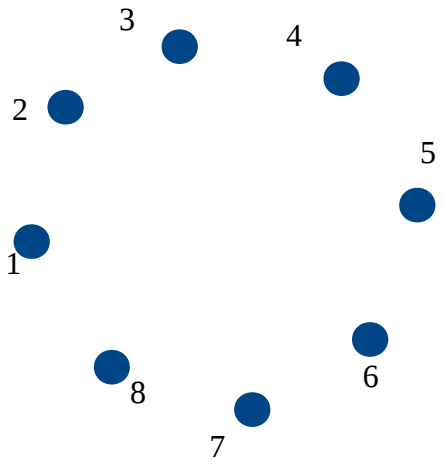
_____ (c) A function is _____ if every point in the codomain has exactly one arrow ending at that point.

Binary relations (10%)

_____ Complete the arrow diagram for each of the relations on A = { 1, 2, 3, 4, 5, 6, 7, 8 }, and decide if it has any reflexive, antisymmetric, or transitive properties. For each property that a relation does not have, illustrate this failure with a specific example.

R_1 = { (1, 1), (1, 2), (1, 4), (1, 8), (2, 2), (2, 4), (2, 8), (3, 3), (3, 6), (4, 4), (4, 8), (5, 5), (6, 6), (7, 7), (8, 8) }

Is this transitive, antisymmetric, and/or reflexive?



Equivalence relations (15%)

_____ Let S = {1, 2, 3}. For each of the following relations on $\wp(S)$, draw the arrow diagram and decide if the relation is reflexive, symmetric, or transitive. If it is all three (i.e., an equivalence relation), give the corresponding partition of $\wp(S)$.

$$R_5=\{(A,B)\in\wp(S)\times\wp(S):n(A)=n(B)\}$$

Reflexive?

Symmetric?

Transitive?

If equivalence relation:
Give the partition.