CS 173, Spring 2016
Examlet 4, Part B

NETID:

FIRST: | **LAST:**

Discussion: **Monday** **9** **10** **11** **12** **1** **2** **3** **4** **5**

1. (5 points) Check all boxes that correctly characterize this relation on the set $\{A, B, C, D, E, F\}$.

$$\begin{tikzcd} A \arrow[r] & C \arrow[r] & E \arrow[d] \\ B \arrow[u] & D \arrow[l] & F \arrow[l] \end{tikzcd}$$

Reflexive: ☐ Irreflexive: ☐

Symmetric: ☐ Antisymmetric: ☐

Transitive: ☐

2. (5 points) Suppose that R is a relation on the integers such xRy if and only if $x = y$. Is R a partial order?

3. (5 points) Let's define the equivalence relation $\sim$ on $\mathbb{R}$ sucn that $x \sim y$ if and only $|x - y| \in \mathbb{Z}$. List three members of $[1.7]$.

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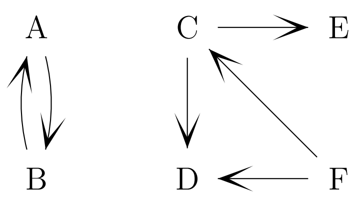
1. (5 points) Check all boxes that correctly characterize this relation on the set $\{A, B, C, D, E, F\}$.



Reflexive: ☐ Irreflexive: ☐

Symmetric: ☐ Antisymmetric: ☐

Transitive: ☐

2. (5 points) Can a relation with at least one related pair (i.e. at least one arrow in a diagram) be irreflexive, symmetric, and also transitive? Either give such a relation or briefly explain why it's not possible to construct one.

3. (5 points) Suppose that R is a relation on the integers such xRy for all integers x and y. Is R a partial order?

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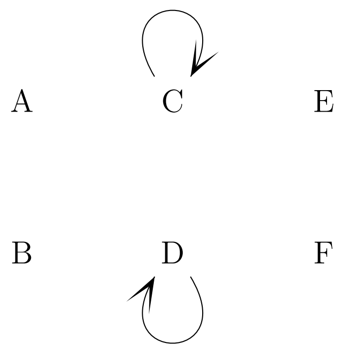
1. (5 points) Check all boxes that correctly characterize this relation on the set $\{A, B, C, D, E, F\}$.



Reflexive: ☐ Irreflexive: ☐

Symmetric: ☐ Antisymmetric: ☐

Transitive: ☐

2. (5 points) Suppose that R is a relation on a set A. Using precise mathematical words and notation, define what it means for R to be antisymmetric.

3. (5 points) Let R be the relation on $\mathbb{Z}$ such that xRy if and only if $|x| + |y| = 2$

   Is R transitive? Informally explain why it is, or give a concrete counter-example showing that it is not.

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1. (5 points) Check all boxes that correctly characterize this relation on the set $\{A, B, C, D, E, F\}$.

$$A \longrightarrow C \longleftarrow E$$

$$B \longrightarrow D \longleftarrow F$$

Reflexive: ☐ Irreflexive: ☐

Symmetric: ☐ Antisymmetric: ☐

Transitive: ☐

2. (5 points) A relation is a strict partial order if it has which three properties? (Naming the properties is sufficient. You don't have to define them.)

3. (5 points) Let R be the relation on $\mathbb{Z}$ such that xRy if and only if $|x| + |y| = 2$

   Is R reflexive? Informally explain why it is, or give a concrete counter-example showing that it is not.

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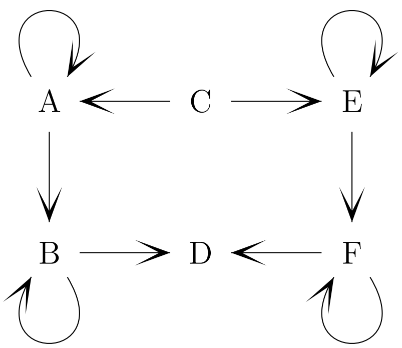
1. (5 points) Check all boxes that correctly characterize this relation on the set $\{A, B, C, D, E, F\}$.



Reflexive: ☐ Irreflexive: ☐

Symmetric: ☐ Antisymmetric: ☐

Transitive: ☐

2. (5 points) Suppose that R is a relation on a set A. Using precise mathematical words and notation, define what it means for R to be transitive.

3. (5 points) Let's define the equivalence relation $\sim$ on $\mathbb{N}^3$ sucn that $(x, y, z) \sim (p, q, r)$ if and only $x + y + z = p + q + r$. List three members of $[(0, 0, 1)]$.