Birzeit University
Department of mathematics
Math 243
Spring 2021

Name . . . . .   Number . . .

Q #1) Let $S = \{(x,y) \in \mathbb{R} \times \mathbb{R} \mid |x| + |y| = 1\}$ be a relation on $\mathbb{R}$

(20%)

a) sketch the graph of S

b) what is the domain and range of S.

c) Is S reflexive, symmetric, transitive. Justify your answer.

d) Find $S[\frac{1}{2}]$

Q #2. Let R, S be relations on A. prove or disprove

(20%)

a) $R \circ S = S \circ R$.

b) if $R \subseteq S$ then $R^{-1} \subseteq S^{-1}$

c) $(R \cup S)^{-1} = R^{-1} \cup S^{-1}$

d) if R is transitive then R^{-1} is transitive

Q #3: Let $A = \{1,2,3,4\}$, $X = P(A)$ the power set of A, define R on X as follows.

(15%)

$(C, D) \in R$ iff C and D contains same number of elements.

a) show that R is equivalence relation on X.

b) Find $R[\{1,2\}]$.

Q#4:- Let $A = \{a, b, c, d, e\}$

Let $P = \{\{a, c\}, \{b, e\}, \{d\}\}$.

(15%)

a) Is P a partion of A.

b) Find an equivalence relation on ~~A~~ on A. such that its equivalence classes is P

Q#5 prove or give a counter example

(15%)

a) if R an S are symmetric then $(R \circ S)$ is also symmetric

b) if $R \circ S = S \circ R$ then $S = R$.

Q#6

(15%)

a) show that if $f: A \to B$ and $g: B \to C$ are 1-1 functions then $g \circ f: A \to C$ is 1-1

b) Let f, g be functions from A to A prove that $(f \circ g)^{-1} = g^{-1} \circ f^{-1}$.