

MATH 250 HANDOUT 16 - EQUIVALENCE RELATIONS

- (1) Which of the following are equivalence relations? (Which are reflexive, symmetric, or transitive?)
- (a) Let S be the collection of all sets and say that $A \sim B$ if there is a bijection from A to B .
 - (b) Let S be the collection of all sets and say that $A \sim B$ if there is a surjection from A to B .
 - (c) Let S be the collection of all sets and say that $A \sim B$ if there is an injection from A to B .
 - (d) Let S be the collection of all sets and say that $A \sim B$ if $A \cap B$ is empty.
 - (e) Let x and y be real numbers and define $x \sim y$ if $x - y \in \mathbb{Q}$.
 - (f) Let x and y be rational numbers and define $x \sim y$ if $x - y \in \mathbb{Q}_{\geq 0}$.
 - (g)
 - (h) Let x and y be integers and define $x \sim y$ if $x - y \in d\mathbb{Z}$.
 - (i) Let x and y be real numbers and define $x \sim y$ if $x = 1$ or $y = 1$.
 - (j) Let x and y be real numbers and define $x \sim y$ if $x = 1$ or $y = -1$.
 - (k) Let $\mathbb{Q}[x]$ be the set of polynomials with rational coefficients. Say that $f \sim g$ if their derivatives are equal.
 - (l) Say that $f \sim g \in \text{Fun}(\mathbb{R}, \mathbb{R})$ are equivalent if there exists an interval (a, b) such that $a < 0 < b$ and such that $f(x) = g(x)$ for all $x \in (a, b)$.
 - (m) Say that $f \sim g \in \text{Fun}(\mathbb{R}, \mathbb{R})$ are equivalent if there exists an interval (a, b) such that $a < b$ and $f(x) = g(x)$ for all $x \in (a, b)$.
 - (n) Say that $f \sim g \in \text{Fun}(\mathbb{R}, \mathbb{R})$ are equivalent if there exists an interval (a, b) such that $f(x) = g(x)$ for all $x \in (a, b)$.
 - (o) Say that two power series f and g are related if all but finitely many of their coefficients are the same.
 - (p) Say that two power series f and g are related if at least one of their coefficients are the same.
 - (q) Say that two power series f and g are related if $f - g$ is a polynomial.

Answers (please circle):

- (a) R S T
- (b) R S T
- (c) R S T
- (d) R S T
- (e) R S T
- (f) R S T

- (g) R S T
- (h) R S T
- (i) R S T
- (j) R S T
- (k) R S T