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 real numbers and define $x \sim y$ if $x = 1$ or $y = 1$.
   (g) Let $x$ and $y$ be real numbers and define $x \sim y$ if $x = 1$ or $y = -1$.
   (h) Let $\mathbb{Q}[x]$ be the set of polynomials with rational coefficients. Say that $f \sim g$ if their derivatives are equal.
   (i) 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 $x \in (a, b)$.
   (j) 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 $x \in (a, b)$.
   (k) 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 $x \in (a, b)$.
   (l) Say that two power series $f$ and $g$ are related if all but finitely many of their coefficients are the same.
   (m) Say that two power series $f$ and $g$ are related if at least one of their coefficients are the same.
   (n) 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