If you are using the 2nd edition, be careful — question numbers may not agree.

- 8.32, 8.38, 8.40, 8.42, 8.46, 8.50
- 9.4, 9.6 (c)(e)
- 9.8. Then repeat Problem 9.8 but with \( B = \{10, 7\} \).
- 9.12 (a) (e), 9.16

EQ1 Let \( A \) be the set \( \{1, 2, 3\} \). Answer the following:

(a) Consider the relation \( \{(1,1), (2,2), (3,1), (3,3)\} \) on \( A \). Determine whether or not it is an equivalence relation. If it is not, state which properties it is lacking. If it is, describe the partition it determines by listing the subsets of the partition.

(b) Repeat (a) for the relation \( \{(1,1), (2,3), (2,2), (3,2), (3,3)\} \) on \( A \).

EQ2 Let \( A = \mathbb{N} \times \mathbb{N} \), and define a relation \( R \) on \( A \) by \( (a,b)R(c,d) \) if and only if \( ab = cd \).

(a) Show that \( R \) is an equivalence relation on \( A \).

(b) List the elements in the equivalence class \( [(9,2)] \).

(c) Find an equivalence class with exactly two elements.

(d) Find an equivalence class with exactly three elements.

EQ3 Let \( A = \{1, 2, 3, 4\} \). Give an example of a relation on \( A \) that is

(a) reflexive and symmetric but not transitive

(b) reflexive and transitive but not symmetric

(c) symmetric and transitive but not reflexive

(d) reflexive but neither symmetric nor transitive

(e) symmetric but neither reflexive nor transitive

(f) transitive but neither reflexive nor symmetric

EQ4 Let \( A = \{1\} \) and \( B = \{1, 2\} \).

(a) Determine all relations on \( A \).

(b) Determine all relations from \( A \) to \( B \).

(c) Determine all equivalence relations on \( B \).
EQ5 Let $A$ be a non-empty set. Let $R = \emptyset$. Is $R$ an equivalence relation on $A$: why or why not?

EQ6 Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = x^2$. For $x, y \in \mathbb{R}$, write $xRy$ if and only if $f(x) = y$.

(a) Verify that $R$ is a relation on $\mathbb{R}$.

(b) Is $R$ an equivalence relation: why or why not?

(c) Find the domain and range of $R$, $\text{dom}(R)$ and $\text{rng}(R)$.

(d) Describe the inverse relation $R^{-1}$.

(e) Sketch $R$ and $R^{-1}$.

(f) Does $R^{-1}$ correspond to the graph of a function: why or why not?