ECE335 Summer 2019 - Lecture 20 Examples

Example 1: Given the following set $A = \{1, 2, 3, 4\}$, define a binary relation as

$$R = \{(1, 1), (2, 1), (3, 1), (4, 4)\}$$

Is R a function? Explain.

Yes, each first element has a unique output, i.e. there are no two first elements that are the same but with different second elements.

Example 2: Given the following set $A = \{0, 2, 4, 6, 8, 10\}$, define a binary relation as

$$R = \{(0, 6), (2, 10), (4, 8), (6, 0), (8, 4), (10, 2)\}$$

a. Is R a function? Explain.

Yes, each first element has unique second elements.

b. Is R *one-to-one*, i.e. an *injection*? Explain.

Yes, each output appears only once.

c. Is R *onto*, i.e. a *surjection*? Explain.

Yes, since $Range(R) = A$, i.e. every element of A is an output for some input.

d. Is R^{-1} a function, i.e. is R a *bijection*? Explain.

Since R is one-to-one + onto, R^{-1} exists and is a function (note $R = R^{-1}$ in this case)