BIBMT1114 Discrete Mathematics

Weekly Exercise 2

1. Compute $\mathbf{A} \vee \mathbf{B}$, $\mathbf{A} \wedge \mathbf{B}$, $\mathbf{A} \odot \mathbf{B}$ for the given matrices $\mathbf{A}$ and $\mathbf{B}$.

   a) $\mathbf{A} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

   b) $\mathbf{A} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 0 & 1 \end{bmatrix}$

2. Tell whether the structure has the closure property with respect to the operation.

   a) $(\text{sets}, \cup, \cap, \bar{\ })$ complement

   b) $(\text{integers}, +, -, \times, \div)$ division

3. Give the identity element, if one exists, for each binary operation in the given structure

   a) (real numbers, $+$, $*$, $\sqrt{\ }$)

   b) $(\text{sets}, \cup, \cap, \bar{\ })$

4. Let $R = (2 \times 1 \text{ matrices}, \nabla)$, where

   $$\begin{bmatrix} x \\ y \end{bmatrix} \nabla \begin{bmatrix} w \\ z \end{bmatrix} = \begin{bmatrix} x + w \\ y + z + 1 \end{bmatrix}$$

   Determine which of the following properties hold for this structure

   a) Closure

   b) Commutative

   c) Associative

   d) An identity element

   e) An inverse for every element