Closure Properties of Number System (as in this ER) will be used often. Please make sure you get it down. If there is something you do not understand just ask Prof. Girardi.

Recall from the Ch. 1 Handout

Number Systems		
English	symbol	other notation
real numbers	$\mathbb{R}$	$(-\infty, \infty)$
natural numbers	$\mathbb{N}$	$\{1, 2, 3, 4, \ldots\}$
integers	$\mathbb{Z}$	$\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\} \overset{\text{or}}{=} \{0, \pm 1, \pm 2, \pm 3, \pm 4, \pm 5, \ldots\}$
rational numbers	$\mathbb{Q}$	$\{\frac{a}{b} : a, b \in \mathbb{Z} \text{ and } b \neq 0\} \overset{\text{easier}}{=} \{\frac{a}{b} : a \in \mathbb{Z} \text{ and } b \in \mathbb{N}\}$
irrational numbers	$\mathbb{R} \setminus \mathbb{Q}$	$\{x \in \mathbb{R} : x \notin \mathbb{Q}\}$

Recall from Class Example

		Closed under the operation of:				
Number System	**symbol**	addition	subtraction	multiplication	division	division by a nonzero number
real numbers	$\mathbb{R}$	yes	yes	yes	no	yes
nonzero real numbers	$\mathbb{R} \setminus \{0\}$	no	no	yes	yes	yes
irrational numbers	$\mathbb{R} \setminus \mathbb{Q}$	no	no	no	no	no

►. Fill in each empty box in the below chart with either a symbol, yes, or no (as done in the above Class Example chart). No justification needed.

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		Closed under the operation of:				
Number System	symbol	addition	subtraction	multiplication	division	division by a nonzero number
natural numbers	$\mathbb{N}$					
integers	$\mathbb{Z}$					
rational numbers	$\mathbb{Q}$					
nonzero integers	$\mathbb{Z} \setminus \{0\}$					
nonzero rational numbers	$\mathbb{Q} \setminus \{0\}$					