The symbol for the rational numbers is $\mathbb{Q}$ while the symbol for the irrational numbers is $\mathbb{R} \setminus \mathbb{Q}$.

So you can express that x is an irrational number by $x \notin \mathbb{Q}$ or by $x \in \mathbb{R} \setminus \mathbb{Q}$.

Recall for any sets R and Q, the set R set minus Q is the set $R \setminus Q \stackrel{\text{def.}}{=} \{x \in R \colon x \notin Q\}$.

Note the difference in direction in the backslash for set minus ($R \setminus Q$) and quotient of numbers ($1/2 = 0.5$).

▶. **Proposition 3.19**. Symbolically written. (TS book §3.3 page 123)

$$\big(\forall\,(x,y) \in \mathbb{R}^2\big)\ [\ (\ x \in \mathbb{Q} \wedge x \neq 0 \wedge y \notin \mathbb{Q}\ ) \implies xy \notin \mathbb{Q}\ ] \tag{1}$$

1. We have discussed closure properties of number systems (e.g., $\mathbb{R}$, $\mathbb{Q}$, $\mathbb{R} \setminus \mathbb{Q}$) under cetain operations (e.g., addition, multiplication, division by a nonzero number). Proposition 3.19 gives that the irrational numbers are closed under a certain operation. What is this operation?
   Hint: Complete sentences. "The irrational numbers are closed under the operation of ?????".
2. Using that $\sim [P \implies Q] \equiv [P \wedge (\sim Q)]$ ⟨idea: negation of a promise is a lie⟩, symbolically write a negation (denial) if the statement in (1). Your answer can not contain the negation symbol $\sim$ ⟨nor any variant of the $\sim$ symbol⟩. Your answer can contain the symbols $\in$ and $\notin$.

hint. You may use Proposition 3.19 in the ER's from §3.3 and beyond.

. . . . . .

DELETE this whole sentence and THEN put your answer to ALL parts down here.