

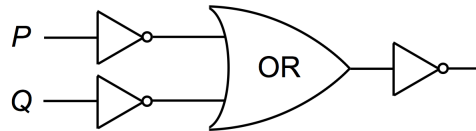
Exercises from Section 5.2

- Exercise 5.2.3 (page 147) — Matrix for a NOR gate.

$$NOR = NOT \star OR = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \star \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

- Exercise 5.2.7 (page 151) — DeMorgan's law.

DeMorgan's law: $\neg(\neg P \vee \neg Q) = P \wedge Q$



$$\begin{aligned} NOT \star OR \star (NOT \otimes NOT) &= \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \star \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \end{bmatrix} \star \begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix} \\ &= \begin{bmatrix} 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \\ &= AND \end{aligned}$$