Math 3100 Zachary A. Hampton
LaTeX Assignment 3 09-23-2024

Theorem. $(P \vee Q) \to R \equiv (P \to R) \wedge (Q \to R)$

Solution:

Proof. Let P, Q, and R be statements. We begin with the left side and work towards the right side:

$$\begin{aligned}
(P \vee Q) \to R &\equiv \neg(P \vee Q) \vee R && \text{[Conditional as Disjunction]} \\
&\equiv (\neg P \wedge \neg Q) \vee R && \text{[De Morgan's Law]} \\
&\equiv (\neg P \vee R) \wedge (\neg Q \vee R) && \text{[Distribution]} \\
&\equiv (P \to R) \wedge (Q \to R) && \text{[Conditional as Disjunction]}
\end{aligned}$$

Therefore, $(P \vee Q) \to R \equiv (P \to R) \wedge (Q \to R)$. □

Reflection:

- I worked from the left side and found the right.
- Remembering the problem we did in-class, the left side jumped out instantly at me.
- I did not get stuck, it just takes some time.
- I did not use Dr. Johnson's solution or help from any other source other than The Summary of Useful Logical Equivalences and my notes; I did however use ChatGPT to help clean up my Latex code.