

HOMEWORK 4  
MATH 3345 – SPRING 2024 – KUTLER

**Exercises**

Please complete the following problems on your own paper. Solutions should be written clearly, legibly, and with appropriate style.

1. **[Falkner Section 2 Exercise 14]** Show by means of an explanation in words that the sentence  $(P \wedge Q) \Rightarrow (P \vee Q)$  is a tautology. (As usual, you should use the method of conditional proof.) **You do NOT need to use the book’s method of “discharging assumptions.”**
2. **[Falkner Section 2 Exercise 15]** Use the method of conditional proof to explain in words why the sentence

$$\{(P \vee Q) \wedge [(P \Rightarrow R) \wedge (Q \Rightarrow S)]\} \Rightarrow (R \vee S)$$

is a tautology. **You do NOT need to use the book’s method of “discharging assumptions.”**

**Practice Problems**

It is strongly recommended that you complete the following problems. There is no need to write up polished, final versions of your solutions (although you may find this a useful exercise). Please do not submit any work for these problems.

1. **[Compare with Practice Problem 1 from Homework 3.]** Write a conditional proof to show that the sentence

$$[(P \vee Q) \wedge \neg Q] \Rightarrow P$$

is a tautology (that is, it is true for all possible truth values of  $P$  and  $Q$ ).

2. **[Falkner Section 2 Exercise 13]** Show by means of an explanation in words that the sentence  $P \Rightarrow (P \vee Q)$  is a tautology.