**Task 1**In this assignment, we delve into the fascinating world of logic gates and their role in a basic arithmetic circuit designed for binary addition. We will conduct a comprehensive analysis of the circuit's behavior with varying inputs, categorizing the possible outcomes based on the rules of binary arithmetic. Let's embark on this logical exploration to unravel the intricacies of binary addition.

Explore the logic gates used in a basic arithmetic circuit for binary addition. You are given two 2-bit binary inputs, A and B, and your task is to design a combinational logic circuit that performs the addition operation (A + B) and produces the 2-bit result C.

1. Utilize logic gates such as AND, OR, and XOR gates in your design.

2. Present the truth table and circuit diagram for this arithmetic circuit to illustrate its functioning.

3. Provide a step-by-step explanation of how the inputs are processed through the gates to obtain the final output.

4. Furthermore, conduct an analysis of the circuit's behavior when different inputs are applied, and categorize the possible outcomes based on the rules of binary arithmetic.

Your Discussion should be a minimum of 500 words in length and not more than 750 words. Please include a word count. Following the APA standard, use references and in-text citations for the textbook and any other sources.

End your discussion post with one question related to the concepts learned in this unit, from which your colleagues can formulate a response or generate further discussion.  
  
**Task 2**

Assignment Instructions:

This assignment will enhance your understanding of practical applications of Boolean algebra and logic gates in electronics, fostering problem-solving, critical thinking, and communication skills while emphasizing efficiency in circuit design.

In this learning journal assignment, we immerse ourselves in the world of electronics by creating digital circuits using Boolean algebra and logic gates. This assignment challenges you to fulfill specific conditions, such as ensuring the light bulb turns on when the switch is closed (ON position) and off when the switch is open (OFF position), while using the fewest possible logic gates for simplicity and efficiency.

Scenario:

John is an electronics enthusiast who loves designing and building digital circuits using Boolean algebra and logic gates. He has been tasked with creating a simple circuit that can turn on a light bulb using a switch. John wants to utilize his knowledge of Boolean algebra and logic gates to design an efficient and reliable circuit for this purpose.

Assignment:

Using Boolean algebra and logic gates, design a digital circuit that can control a light bulb with a switch. The circuit should meet the following conditions:

The light bulb should turn on when the switch is closed (ON position) and turn off when the switch is open (OFF position).

Use the fewest number of logic gates possible to keep the circuit simple and efficient.

Clearly depict the logic gates you choose to use and explain the reasoning behind your choices.

Please provide a step-by-step explanation of your circuit design based on the following steps below.

Identification of input and output signals.

Application of Boolean algebra laws, and

The depiction of the final circuit.

Submission Instructions:

Submit the solution in a word document.

Make sure your submission is double-spaced, using Times New Roman, 12-point font, with 1” margins.

Use sources to support your arguments. Add a reference list at the end of the submission. For assistance with APA formatting, view the Learning Resource Center: Academic Writing.

Your submission should be clearly written, concise, and well organized, and free of spelling and grammar errors. Read the grading rubric to understand how your work will be evaluated.