# Homework 2: Universal Gates & Flip Flops

**CS 200 • 10 Points Total**
**Due Wednesday, February 2, 2022**


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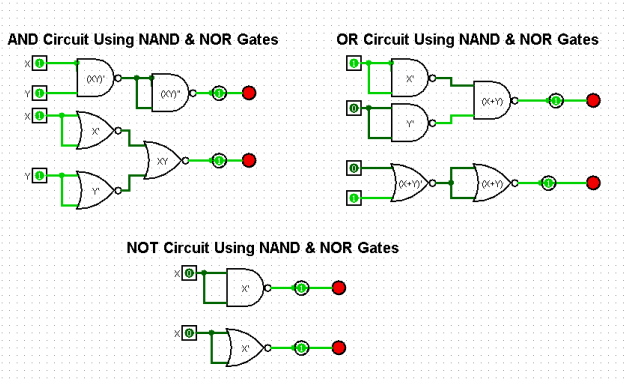
**Assignment**

Answer each of the following questions based on Chapter 3 of the Null textbook.

1. Which gates are called "universal" gates? Why? (2 pts)

   The universal gates are the NAND gate and the NOR gate. This is because you can build any circuit using either type of gate, which makes circuits cheaper to build when you are using all of the same types of gate.

2. Draw two sets of logic circuits for AND, OR, and NOT using each of the universal gates from question 1. In other words, draw an AND circuit using only the one kind of gate and then draw it again using only the other kind of gate. (3 pts)




3. What's the difference between combinational logic and sequential logic? (2 pts)

   In a combinational circuit, it's outputs are based only on the inputs that are given. In a sequential circuit, it's output is based on the current input as well as previous inputs.

4. What ARE flip-flops? (2 pts)

   A flip-flop is a sequential circuit that has exactly 2 states, '0' and '1'.

5. Make a table showing all the state transitions for a J-K flip-flop. (1 pt)

| J | K | Q(t+1) |
|---|---|---|
| 0 | 0 | Q(t) |
| 0 | 1 | 0 |
| 1 | 0 | 1 |
| 1 | 1 | Q’(t) |

*This is the same table that is referenced in the book, I am assuming this is what you were looking for.*