CS270 Recitation 10
## "Introduction to Logisim"

Goals

To understand how to design and debug combinatorial circuits using the Logisim logic simulator.

The Assignment

Make a subdirectory called R10 for this recitation, where all files should reside. Logisim can be found in the directory shown below, using the following command:

```
$ ~cs270/logisim/logisim
```

You should see the window shown below. Icons for AND, OR, and NOT gates are along the top. More gates can be found by expanding the Gates section in the tree on the left side. Outputs are the circles, and inputs are the squares. Select any of the icons by clicking and you will be able to drop it in the circuit area. Once you have components placed, click the black arrow icon and connect the components with wires by dragging the mouse from one component to another. Drag a wire onto another to make a connection, indicated by a dot. Outputs and inputs can be named by changing their *Label* property.
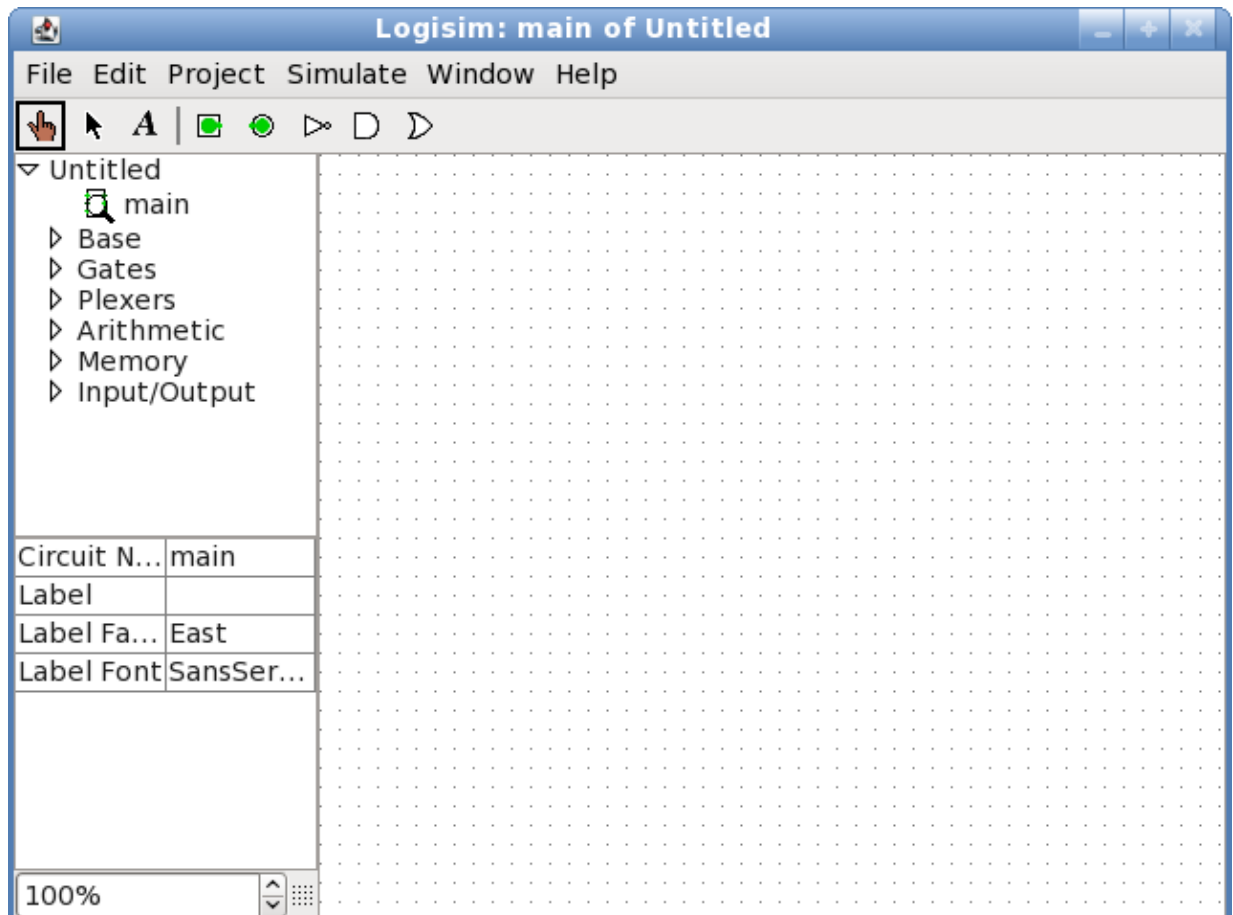
1) Design the circuit shown below:
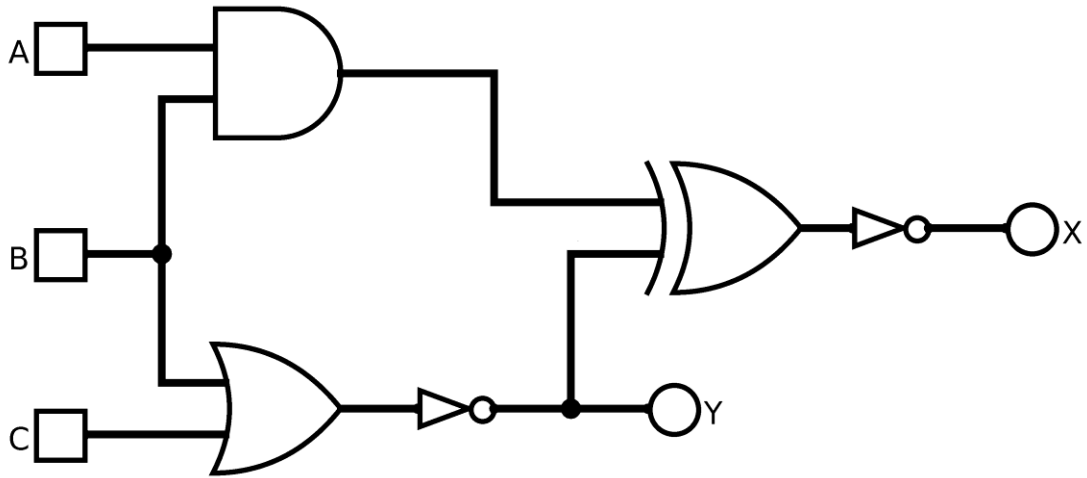
2) Find truth table values by manually toggling the input values and examining the output values. This is done in Logisim by selecting the hand icon and then clicking on each input. Fill in the rest of the truth table for the circuit manually:

A	B	C	Y	X
0	0	0	1	
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		0

3) Next, generate the complete truth table with Logisim by selecting Project->Analyze Circuit from the Project menu and then viewing the table tab. Does it match the one you filled in above? If not, check your answers or your circuit.

4) Build a new circuit that implements the truth table below, and verify it by checking against the truth table made with Logisim. Use the method in section 3.3.4 of the book. Your TA will show you an example.

A	B	C	X
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

5) Build a new circuit that implements the truth table below, and verify it by checking against the truth table made with Logisim. What kind of circuit does this represent?

A	B	W	X	Y	Z
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

6) Build the NOR gate shown below using p-type and n-type transistors, and check its truth table. Pay attention to the direction of the transistors.
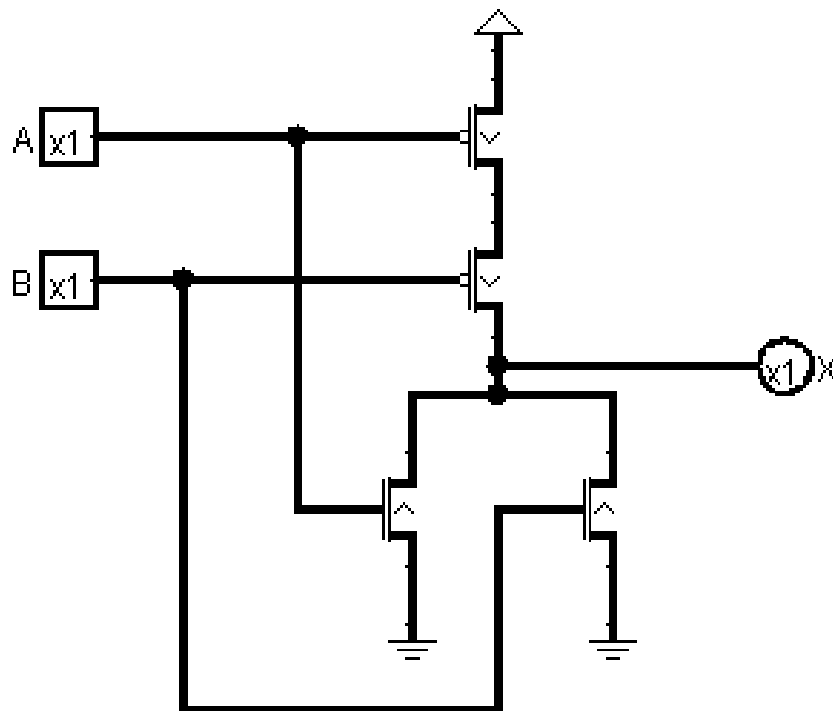
7) Build a NAND gate using p-type and n-type transistors only (no gates). Check its truth table.