Q 1. (3 points) Assume that $a = 1$, $b = 2$, and $c = 2$. What is the value of each of the following Boolean expressions?

$(a > 1) \text{ OR } (b = c)$

$=> \text{False OR True } => \text{ True}$

$[(a + b) > c] \text{ AND } (b \leq c)$

$=> \text{True AND True } => \text{ True}$

$\text{NOT } [(a = b) \text{ OR } (b = c)]$

$=> \text{NOT[False OR True] } => \text{ NOT[True] } => \text{ False}$

Q2. (1 point) The truth table for a Boolean expression with two variables has four rows. The truth table for a Boolean expression with three variables has eight rows. How many rows would there be in a truth table with five variables?

$2^5 = 32$

Q3. (4 points - 2 for Boolean expression and 2 for circuit) Design a circuit using only AND, OR, and NOT gates to implement the following truth table - give Boolean expression and then circuit.

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Expression: $\neg a \cdot \neg b + \neg a \cdot b + a \cdot \neg b$
Q4. (1 point) How many selector lines would be needed on an eight-input multiplexor?

3

Q5. (1 point) (True/False)
(a) Two’s complement representation is a signed integer representation that does not suffer from the problem of two zeros.

True

(b) To construct an NAND gate, two transistors are connected in parallel.

False