Print this cover sheet and write your name on it.
Don’t write anything else on this cover sheet. Do your work on separate paper.
You are encouraged to work together, but the words that you write should be your own.
Assemble your pages in order and staple this cover sheet to the front.
Turn in at the beginning of class on Friday, January 13, 2017. Late papers will not be accepted.

1. (similar to suggested problems 2.1#25, 36) Use DeMorgan’s laws to find the following negations.
   (a) Find the negation of statement $P$: Bob is green and George is red.
   (b) Find the negation of statement $Q$: $5 \leq x < 6$.

2. (similar to suggested problem 2.1#41)
   (a) Make a truth table for the statement form $(\sim p \lor q) \lor (p \land \sim q)$
   (b) Is the statement form in (a) a tautology, a contradiction, or neither? Explain.

3. (similar to suggested problem 2.2#7) Make a truth table for the statement form $\sim p \land q \rightarrow r$

4. (similar to suggested problems 2.2#15 and 2.1#14,16)
   (a) Use a truth table to verify that $p \rightarrow q \equiv \sim p \lor q$
   (b) Explain why $\sim(p \rightarrow q) \equiv p \land \sim q$

5. Suppose that $p$ and $q$ are statements such that $p \rightarrow q$ is false. Find the truth values of the following:
   (a) $\sim p \rightarrow q$
   (b) $p \lor q$
   (c) $q \rightarrow p$

6. (similar to suggested problems 2.2#20, 22, 23) Consider statement $S$: If $x = 3$, then $x^2 = 9$.
   (a) In words, write the contrapositive of $S$.
   (b) In words, write the converse of $S$.
   (c) In words, write the inverse of $S$.
   (d) In words, write the negation of $S$.

7. (a) Give an example of a conditional statement $A$ such that $A$ is true and the converse of $A$ is false.
   (b) Give an example of a conditional statement $B$ such that $B$ is true and the converse of $B$ is also true.

8, 9. (Similar to suggested problems 2.3 #6, 7, 8, 12)
Two argument forms are shown at right. Use truth tables to determine whether they are valid or invalid. Be sure to indicate which columns represent the premises and which represent the conclusion, and include an explanation to support your answers.

<table>
<thead>
<tr>
<th>Problem</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>$a \rightarrow c$</td>
<td>$a \rightarrow b$</td>
<td></td>
</tr>
<tr>
<td>$b \rightarrow c$</td>
<td>$\sim a$</td>
<td></td>
</tr>
<tr>
<td>$\therefore a \lor b \rightarrow c$</td>
<td>$\therefore \sim b$</td>
<td></td>
</tr>
</tbody>
</table>

10. (Similar to suggested problems 2.3 #24, 27, 29)
An argument is shown at below. The argument might be valid, or it may exhibit the converse error or the inverse error. Use symbols to write the logical form of the argument. If the argument is valid, identify the rule of inference that guarantees its validity. Otherwise, state whether the converse error or the inverse error was made.

If $x^2 < 25$, then $x < 5$.
$x < 5$
Therefore, $x^2 < 25$.  

If $x^2 < 25$, then $x < 5$.  
$x < 5$  
Therefore, $x^2 < 25$.  

$\therefore a \lor b \rightarrow c$  
$\therefore \sim b$