PHIL07 (Honors)
Midterm Exam

Section 1: Indicate whether the following claims are true (“T”) or false (“F”) [5 pts each]

1. Some unsound arguments have a true conclusion T____
2. Every invalid argument has a false premise F____
3. If an argument has true premises and a true conclusion, then it is sound. F____

Section 2: Indicate whether the following expressions are WFFs (“yes”) or not (“no”) [5 pts each]

1. (~P & P) & (P <-> (Q v ~Q)) Y____
2. (~P v (Q & R)) N____

Section 3: Using the translation scheme below, translate the following sentences from English to the language of propositional logic. Your translation must be a WFF. [10 pts each]

A = The Cleveland pitcher throws at someone again
B = The Cleveland pitcher is out of the game
C = The Cleveland manager is out of the game
D = The Detroit pitcher throws at someone again
E = The Detroit pitcher is out of the game
F = The Detroit manager is out of the game

1. Provided that neither pitcher throws at someone again, neither manager will be thrown out of the game.

   (~A & ~B) -> (~C & ~F)

2. If either pitcher throws at anyone again, both he and his manager will be thrown out of the game.

   (A->(A&C)) & (D->(D&F))

3. If both the Cleveland and Detroit managers are out of the game, then exactly one of the two pitchers will throw at someone again.

   ((C&F)->((A&D) & ~(A&D)))
Section 4: Construct proofs for the following sequents.
[15 pts. each—5 pts allocated for correct notation, 10 pts for a correct and complete proof]

1. \[ \neg P, ((P \lor Q) \leftrightarrow (R \lor \neg P)) \vdash Q \]

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<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>\neg P</td>
<td>A</td>
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<tr>
<td>2</td>
<td>2</td>
<td>(P \lor Q) \leftrightarrow (R \lor \neg P)</td>
<td>A</td>
<td></td>
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<tr>
<td>2</td>
<td>3</td>
<td>(R \lor \neg P) \rightarrow (P \lor Q)</td>
<td>2&lt;-&gt;E</td>
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<tr>
<td>1</td>
<td>4</td>
<td>R \lor \neg P</td>
<td>1\lor I</td>
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<td>1,2</td>
<td>5</td>
<td>P \lor Q</td>
<td>3,4-&gt;E</td>
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<td>1,2</td>
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<td>Q</td>
<td>1,5\lor E</td>
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\[
\vdash (P \leftrightarrow Q) \rightarrow ((R \& P) \leftrightarrow (R \& Q))
\]

\[
\begin{align*}
1 \quad & (1) \quad P \leftrightarrow Q & A \\
2 \quad & (2) \quad R \& P & A \\
1 \quad & (3) \quad P \rightarrow Q & 1 \leftrightarrow E \\
2 \quad & (4) \quad P & 2 \& E \\
1,2 \quad & (5) \quad Q & 3,4 \rightarrow E \\
2 \quad & (6) \quad R & 2 \& E \\
1,2 \quad & (7) \quad R \& Q & 5,6 \& I \\
1 \quad & (8) \quad (R \& P) \rightarrow (R \& Q) & 7 \rightarrow I (2) \\
9 \quad & (9) \quad R \& Q & A \\
9 \quad & (10) \quad R & 9 \& E \\
9 \quad & (11) \quad Q & 9 \& E \\
1 \quad & (12) \quad Q \rightarrow P & 1 \leftrightarrow E \\
1,9 \quad & (13) \quad P & 11,12 \rightarrow E \\
1,9 \quad & (14) \quad R \& P & 10,13 \& I \\
1 \quad & (15) \quad (R \& Q) \rightarrow (R \& P) & 14 \rightarrow I (9) \\
1 \quad & (16) \quad (R \& P) \leftrightarrow (R \& Q) & 8,15 \leftrightarrow I \\
(17) \quad & (P \leftrightarrow Q) \rightarrow ((R \& P) \leftrightarrow (R \& Q)) & 16 \rightarrow I (1)
\end{align*}
\]
3. \((PvQ)vR \vdash Pv(QvR)\)

1 (1) \((PvQ)vR\) A
2 (2) \(~(Pv(QvR))\) A
3 (3) \(~(PvQ)\) A
1,3 (4) R 1,3vE
1,3 (5) QvR 4vI
1,3 (6) \(Pv(QvR)\) 5vI
1,2 (7) \(PvQ\) 2,6RAA(3)
8 (8) \(~Q\) A
1,2,8 (9) P 7,8vE
1,2,8 (10) \(Pv(QvR)\) 9vI
1,2 (11) Q 2,10RAA(8)
1,2 (12) QvR 11vI
1,2 (13) \(Pv(QvR)\) 12vI
1 (14) \(Pv(QvR)\) 2,13RAA(2)

E.C.: _________________

NAME________________________