1. Is the following sentence valid? Explain your answer for full credit [4 points]
   \[(A \Rightarrow B) \lor (\neg A \Rightarrow \neg B)\]

2. In this question, we will be dealing with a 2x2 Wumpus world as shown below.

   \[
   \begin{array}{cc}
   (1,1) & (1,2) \\
   (2,1) & (2,2)
   \end{array}
   \]

   Let \(P_{i,j}\) indicate that there is a pit at \((i,j)\) and let \(B_{i,j}\) indicate that there is a breeze at \((i,j)\).
   a) How would you write out the following in propositional logic for this 2x2 world (your sentences need not be in Conjunctive Normal Form):
   A square is breezy if and only if a neighboring square has a pit
   Note that cells diagonally touching a cell with a pit will have a breeze. [4 points]
   
   b) Based on your answer to (a), what would you say is a drawback to propositional logic? [2 points]

3. Convert the following KB sentences into Conjunctive Normal Form.
   a) \(A \iff (B \lor C)\) (4 points)
   
   b) \((B \lor C) \Rightarrow D\) (4 points)
4. Suppose the KB contains the following sentences in CNF. Does KB |= ¬R? Show all the resolution steps for partial credit or if it doesn’t resolve, explain why. [8 points]

¬C ∨ E
¬P ∨ E
¬E ∨ ¬R
¬A ∨ ¬P ∨ E