Discrete Math Exam Problem: NAND

Consider the new logical connective $\bar{\wedge}$ (pronounced "NAND"), defined by

$$p \bar{\wedge} q \equiv \neg(p \wedge q).$$

Show how to encode each of the logical connectives $\neg$, $\wedge$, $\vee$, and $\rightarrow$ using only $\bar{\wedge}$. That is, show how to fill in each of the following blanks in such a way that the *only* things in the blanks are the letters p and q, $\bar{\wedge}$, and parentheses. Be sure to prove/justify the correctness of your encodings.

This is significant because it is easy to make a digital logic circuit to compute NAND using only two transistors. Some digital logic circuits are in fact built completely out of NAND.

- $\neg p \equiv$ _____

- $p \wedge q \equiv$ _____

- $p \vee q \equiv$ _____

- $p \rightarrow q \equiv$ _____

Remember to also upload a short video of yourself explaining your solution. Either visit `http://flipgrid.com/hdxdiscrete` and choose this problem from the list of problems, or go to the course website and click the FlipGrid logo next to this problem in the course calendar.