

MATH 110

Homework 3

Recall the operation $P \downarrow Q$, called nor, or joint denial, defined in class (see lecture notes on expressing some operations in terms of others).

1. Show that $P \downarrow Q \equiv \neg(P \vee Q)$ (using the truth table).
2. Express \neg , \vee , \wedge , \rightarrow , \leftrightarrow , and \oplus in terms of \downarrow , (similarly to how we expressed all these operations in terms of \uparrow in class, see lecture notes).
3. Show that $(P \downarrow P) \downarrow (P \downarrow P) \equiv P$.
4. Depending on how you did part 2, you may be able to simplify some of your expressions in part 2 using the identity in part 3. So look over your answers in part 2 and if there is anything that can be simplified, simplify them now. It is possible though that you did those differently and there is nothing that can be simplified there. Then just state so here.

Grading:

part 1 is worth 20%

parts 2 and 4 (if/when needed) are worth 60%, with each operation being 10%

part 3 is worth 20%