Section 1.9: LOL, cont'd

examples: write a simplified expression for each of the
following and identify which law you've used

① $\overline{r} \wedge \overline{r} \Leftrightarrow$ $\overline{r}$ idempotent

② $ABC + ABC =$ ABC "

③ $ABC + \overline{ABC} =$ 1 complement

④ $\emptyset \cup \overline{B} =$ $\overline{B}$ identity

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note: for MATH 163, you may omit writing the
commutative and/or associative laws as
a separate step

example: simplify $0 \vee p$

nitpicker - from - hell $p \vee 0$ commutative
solution:
       p identity

totally acceptable
MATH 163 $0 \vee p$
solution:
       p identity

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simplify using the LOL:

$(\overline{p} \vee 0) \wedge (\overline{q} \vee q) \wedge (1 \vee r)$

$\overline{p} \wedge (\overline{q} \vee q) \wedge 1$ identity

$\overline{p} \wedge 1 \wedge 1$ complement

$(\overline{p} \wedge 1) \wedge 1$ associative

p ¨   1   ¨   1   complement

$(\bar{p} \wedge 1) \wedge 1$ associative but can skip this step

$\bar{p} \wedge 1$ identity

$\bar{p}$ "

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simplify $(p \wedge \bar{p}) \vee (p \vee \bar{p})$

       $0 \quad \vee \quad 1$ complement

        1 { identity / complement / definition of "or"

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simplify $A(\bar{B}B) + B(A + \bar{A})$

       $A \cdot 0 \quad + \quad B \cdot 1$ complement

       $0 \quad + \quad B$ identity

       B "

Summary: identity laws: deal with   zero or one

      idempotent   :   "   -   a variable and/or itself

      complement   :   "   "   negations

      commutative   } can omit
      associative