4. common form: If $p$ then $q$.
   If $q$ then $r$.
   Therefore, if $p$ then $r$.

b. $x$ equals 0; the guard condition for the while loop is false; program execution moves to the next instruction following the loop

45. \[ (\sim (p \lor \sim q) \lor (\sim p \land \sim q)) \equiv (\sim p \land q) \lor (\sim p \land \sim q) \]
   by De Morgan's law and the double negative law
   \[ \equiv \sim p \land (q \lor \sim q) \]
   by the distributive law
   \[ \equiv \sim p \land t \]
   by the negation law for $\lor$
   \[ \equiv \sim p \]
   by the identity law for $\land$