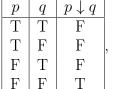
Section 1.3, Problem 50: In this exercise we will show that $\{\downarrow\}$, is a <u>functionally complete set of operators</u>. Recall that \downarrow has the truth table



 $\left| \begin{array}{c} F \\ F \end{array} \right|,$ and that a set of operator is functionally complete if every F

compound proposition is equivalent to a compound proposition involving only operators in the set.

- **a.** Show that $p \downarrow p \equiv \neg p$.
- **b.** Show that $(p \downarrow q) \downarrow (p \downarrow q) \equiv p \lor q$
- **c.** Show that $p \wedge q$ can be written as a compound proposition using only p, q, and \downarrow . Conclude that $\{\downarrow\}$ is functionally complete.

Section 1.4, Problem 36: Find a counterexample, if possible, to these universally quantified statements, where the domain for all variables consists of all real numbers.

- **a.** $\forall x (x^2 \neq x)$
- **b.** $\forall x (x^2 \neq 2)$
- **c.** $\forall x (|x| > 0)$