1. (a) If my parents do not ask me to do my chores, then I don't mind doing them.
   (b) If I mind doing my chores then my parents ask(ed) me to do them.
   (c) If I don't mind doing my chores, then my parents have not asked me to do them.

2.

$$\begin{aligned}
\neg(p \wedge (\neg p \vee q)) &\equiv \neg p \vee \neg(\neg p \vee q) \\
&\equiv \neg p \vee (p \wedge \neg q) \\
&\equiv (\neg p \vee p) \wedge (\neg p \vee \neg q) \\
&\equiv T \wedge (\neg p \vee \neg q) \\
&\equiv \neg p \vee \neg q
\end{aligned}$$

3.

p	q	$p \leftrightarrow q$	$p \to q$	$q \to p$	$(p \to q) \wedge (q \to p)$
F	F	T	T	T	T
F	T	F	T	F	F
T	F	F	F	T	F
T	T	T	T	T	T

Note the third column and final column match, establishing logical equivalence.

4. (d) $\{\{\}, \{0\}, \{1\}, \{0, 1\}\}$
   (e) $\{-2, -1, 2\}$
   (f) $\varnothing$
   (g) Since $A \times A \times B$ has coordinate triples (a_1, a_2, b), and there are 5 possible values for both a_1, a_2 but only two for b, that means there are (5)(5)(2) = 50 elements.
   (h) Since A has 5 elements, the subsets of A correspond to the 5-bit binary words, 00000, 00001, 00010, ..., 11111, of which there are $2^5 = 32$.
   (i) The only values a characteristic function produce are 0 and 1, so the range is $\{0, 1\}$.
   (j) The inputs from $\mathbb{R}$ that would result in the output 1 are precisely those x-values in the interval $(-3, 3]$.
   (k) $f(A) = \{f(-2), f(-1), f(0), f(1), f(2)\} = \{-1, -1, 0, 0, 1\} = \{-1, 0, 1\}$
   (l) $f^{-1}(B) = \{x \in A \,|\, (f(x) = 0) \vee (f(x) = 1)\} = \{0, 1, 2\}$

5. (a) S (b) B (c) N

6. (a) $\exists x \, \forall p \, V(x, p)$ has negation $\neg\exists x \, \forall p \, V(x, p) \equiv \forall x \exists p(\neg V(x, p))$, which leads to this:
   "Given anyone in the class, there is some national park that person has not visited."
   (b) "There is no path from here to there, or there are at least two paths from here to there."
   (c) We have the equivalence $(p \to q) \equiv (q \vee \neg p)$, and that has negation $\neg(q \vee \neg p) \equiv \neg q \wedge p$.
   Translating back to English, this is "I fall asleep and my roommate is snoring."