Key

Quiz 1

Show *all* your work. No credit is given without reasonable supporting work. There are *two* sides to this quiz and all logic symbols make use of the textbook notation.

1. [3] (logic wks #1) Define the *propositions* p and q below:

sentence T/F start (+.5)

p: You do the task. (+.5) (+.5) sense (+.5)

q: You get what you want. (+.5) (+.5)

(a) [1] (§1.1 #9) Express $p \to q$ as an English sentence.

If p, then q

conditional (+.5)
correct (+.5)

If you do the task, then you get what you want

(b) [2] (HW1 §1.1 #2) Assume that p is false, determine if the conditional statement in part (a) is true or false. Justify yourself.

(+.5) Given p is False
Then $p \to q$ is true

start justify (+.5) (+1) reasonable/sense

truth table

p	q	$p \to q$
F	F	T
F	T	T
T	F	F
T	T	T

2. [4] (§1.3 #41) Find a compound proposition involving the propositional variables p, q, and r that is true when exactly two of p, q, and r are true and is false otherwise.

want true when

p is T, q is T, r is F or p is T, q is F, r is T or p is F, q is T, r is T — understand (+.5)

otherwise false

$$(p \wedge q \wedge \neg r) \vee (p \wedge \neg q \wedge r) \vee (\neg p \wedge q \wedge r)$$

wrote one situation (+1.5)
two other situations (+1)
connect with or's (+.5)

3. (HW1 §1.4 #5) Consider the following statement,
"Every koala can climb or speak English."

(a) [3] Express the statement above using predicates, quantifiers, and logical connectives.

(+1) Let $P(x)$ be "x can climb."
Let $Q(x)$ be "x can speak English"
(+.5) Let the domain be Koalas.

$\forall x \; P(x) \vee Q(x)$ (+.5) (+.5)
stat (+.5)

(b) [1] Negate part (a) so that no negation is to the left of a quantifier.

$\neg(\forall x \; P(x) \vee Q(x))$ (+.5)

$\exists x \; \neg(P(x) \vee Q(x))$ or $\exists x \; (\neg P(x) \wedge \neg Q(x))$

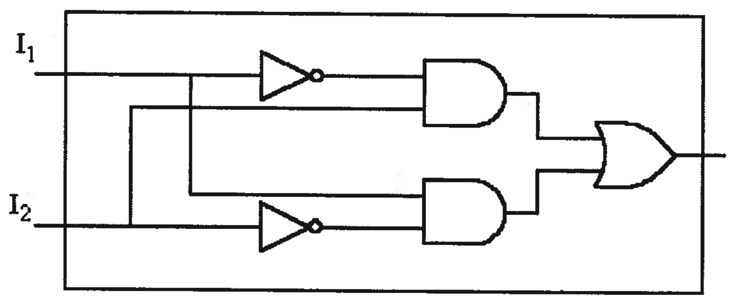
(+.5)

4. [2] (logic wks #2) Let the domain be integers between -4 and 3 inclusive. Determine the truth value of $\forall x, (x + 3 \geq 0)$. Justify yourself.

False (+.5) note -4 is in the domain but stat reasoning (+.5)

$-4+3=-1 \not\geq 0.$
(+1)

5. Consider the following combinatoi



(a) [3] (§1.2 #41)
Find the output of the combinatorial circuit.

(b) [1] Can you write the output of the combinatorial circuit using only one logical connective?

a) $(\neg I_1 \wedge I_2) \vee (I_1 \wedge \neg I_2)$
negations (+1)
and's (+.5)
or's (+.5)
order (+1)

b) $I_1 \oplus I_2$ xor
(+1)