MATH 280 Discrete Mathematical Structures Assignment #4 Name _____

The point values for each question appear within []. The total number of points for this assignment is 42.

[6] 1. Justify each step in the proof sequences.

(a) $P \wedge (Q \to R) \Rightarrow [Q \to (P \wedge R)]$

	Statement	**Reason**
1.	P	
2.	$Q \to R$	
3.	Q	
4.	R	
5.	$P \wedge R$	

(b) $\neg A \wedge B \wedge [B \to (A \vee C)] \Rightarrow C$

	Statement	**Reason**
1.	$\neg A$	
2.	B	
3.	$B \to (A \vee C)$	
4.	$A \vee C$	
5.	$\neg(\neg A) \vee C$	
6.	$\neg A \to C$	
7.	C	

[20] 2. Provide a propositional logic proof sequence (not a truth table) to prove the validity of the following arguments.

(a) $\neg A \wedge (A \vee B) \Rightarrow B$

(b) $(P \to Q) \wedge [P \to (Q \to R)] \Rightarrow (P \to R)$

(c) $(P \to Q) \Rightarrow (\neg Q \to \neg P)$

(d) $A \to (B \to C) \Rightarrow B \to (A \to C)$

[16] 3. Using the predicate symbols shown and appropriate quantifiers, write each English language statement as a predicate wff. The domain is the whole world.

- $B(x)$ is "x is a ball."
- $R(x)$ is "x is round."
- $S(x)$ is "x is used in soccer."

(a) All balls are round.

(b) Some balls are not round.

(c) Not all balls are soccer balls.

(d) Some things are used in soccer.

(e) All soccer balls are round.

(f) Some balls are round, but soccer balls are not.

(g) Every round ball is a soccer ball.

(h) If a ball is not round, then it is not a soccer ball.