Math 2283 - Introduction to Logic

Homework #1 - 2006.08.23
Due Date - 2006.09.01
Solutions

1. Convert the following paragraph to logical expressions using the following predicates and references. It might help to reword certain sentences first.

x refers to Mr. X.
y refers to Dr. Y.
Lcd is "c looked at d"
Sc is "c smiled"
Ac is "c would be forced to take action"
Hc is "c would be happy"

Mr. X looked at Dr. Y and smiled. If Dr. Y smiled, then Mr. X would be forced to take action. If Dr. Y did not smile, then Mr. X would not be forced to take action and both Mr. X and Dr. Y would be happy. But if Dr. Y smiled, he would be happy and Mr. X would not be happy. Dr. Y looked at Mr. X and did not smile.

$Lxy \wedge Sx$
$Sy \Rightarrow Ax$
$\neg Sy \Rightarrow \neg Ax \wedge Hx \wedge Hy$
$Sy \Rightarrow Hy \wedge \neg Hx$
$Lyx \wedge \neg Sy$

2. If Pxy is "x is taller than y", and m refers to male and f refers to female, then how do you interpret the following expressions?

a) $\forall m \; \exists f \; Pmf$
Every man is taller than at least one woman.
b) $\exists m \; \forall f \; Pmf$
At least one man is taller than every woman.
c) $\forall f \; \exists m \; Pmf$
For every woman there exists a taller man.
d) $\exists f \; \forall m \; Pmf$
For at least one woman, every man is taller.

3. Negate the following statements.

a) Some people like cartoons.
All people do not like cartoons.

b) Everyone wants to be a rock star.
Someone does not want to be a rock star.

c) Nobody likes to lose.
At least one person likes to lose.

d) Someone likes to win.
Everyone likes to not win.

e) Each player is a winner.
There is at least one player who is not a winner.