Honors Homework 1
Morally Due Mon Feb 7 at 3:30PM. Dead Cat Feb 10 at 3:30
COURSE WEBSITE: 
(The symbol before gasarch is a tilde.)

1. (0 points) What is your name? Write it clearly.

2. (40 points)

   (a) (10 points) You go to a room with 3 people $A_1, A_2, A_3$. 1 is normal and 2 are truth tellers. Ask YES-NO questions to them to try to determine who is who. Try to make the number of questions as small as possible. (Questions are sequential: Ask a question to $A_1$, and based on the answer decide who to ask what.)

   (b) (10 points) You go to a room with 4 people $A_1, A_2, A_3, A_4$. 1 is normal and 3 are truth tellers. Ask YES-NO questions to them to try to determine who is who. Try to make the number of questions as small as possible. (Questions are sequential: Ask a question to $A_1$, and based on the answer decide who to ask what.)

   (c) (20 points) You go to a room with $n$ people $A_1, \ldots, A_n$. 1 is normal and $n - 1$ are truth tellers. Ask YES-NO questions to them to try to determine who is who. Try to make the number of questions as small as possible. (Questions are sequential: Ask a question to $A_1$, and based on the answer decide who to ask what.)
3. (30 points) For this problem we use the following definitions of $\land$, $\lor$, $\neg$ and are using them on variables with values in $[0, 1]$.

- $x \land y = xy$ (Multiplication)
- $x \lor y = x + y - xy$
- $\neg x = 1 - x$.

Let

$$\phi(x, y, z) = (x \land \neg y) \lor z$$

Describe the set of all $(x, y, z)$ such that $\phi(x, y, z)$ evaluates to $\geq \frac{1}{2}$.

4. (30 points) For this problem we use the following definitions of $\land$, $\lor$, $\neg$ and are using them on variables with values in $[0, 1]$.

- $x \land y = \min\{x, y\}$
- $x \lor y = \max x, y$
- $\neg x = 1 - x$.

Let

$$\phi(x, y, z) = (x \land \neg y) \lor z$$

Describe the set of all $(x, y, z)$ such that $\phi(x, y, z)$ evaluates to $\geq \frac{1}{2}$.