

**HOMEWORK 9**  
**DISCRETE MATHEMATICS I**  
**DUE 02-26**

**Show your work!** For all problems involving syllogisms, show your work symbolically. For all problems involving knights and knaves, give an informal argument justifying your answer.

- (1) In class, the statement “No-one is despised who can manage a crocodile” was translated in three separate ways:

$$\neg(\exists x.(D(x) \wedge M(x))) \quad \forall x.(D(x) \rightarrow \neg M(x)) \quad \forall x.(M(x) \rightarrow \neg D(x)),$$

where  $M(x) \equiv$  “ $x$  is despised” and  $D(x) \equiv$  “ $x$  can manage a crocodile”. Show that these three translations are logically equivalent. (HINT: To show that  $\forall x.P(x) \equiv \forall x.Q(x)$ , you only need to show that  $P(x) \equiv Q(x)$ .)

- (2) Is the following argument valid?

Some babies are illogical.  
Some despised people cannot manage a crocodile.  
Some illogical people are despised.

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$\therefore$  Some baby cannot manage a crocodile.

If so, explain informally why. If not, explain informally why not, and identify what is the least change that could be made to the premises to make it valid.

- (3) ‘Solve’ the following syllogism for its conclusion.

My saucepans are the only things I have that are made of tin.  
I find all *your* presents very useful.  
None of my saucepans are of the slightest use.

- (4) ‘Solve’ the following syllogism for its missing premise.

No one takes in the *Times*, unless he is well educated.  
Those who cannot read are not well educated.  
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$\therefore$  No hedge-hog takes in the *Times*.

- (5) ‘Solve’ the following syllogism for its conclusion.

No books sold here have gilt edges, except what are in the front shop.  
All the *authorised* editions have red labels.  
All the books with red labels are priced at \$5 and upwards.  
None but *authorised* editions are ever placed in the front shop.

- (6) Can an islander (on the Island of Knights and Knaves) say “If I am a knight, then I am a knave”? If so, what can you conclude about him?
- (7) Can an islander say “If I am a knave, then I am a knight”? If so, what can you conclude about him?
- (8) Can two islanders point to one another, and each say “He is a knave”? If so, what can you conclude about them?