

## CIS 716 Homework 4

1. (The next two questions refer to the animals rule base given at the end of this assignment.)

Given the following facts

```
animal gives milk  
animal chews cud  
animal has black stripes
```

use forward chaining to find out what animal is implied.

Note that I don't just want the answer, what I want is for you to give me all the facts that forward chaining infers.

(20 points)

2. Given the following facts

```
animal can fly  
animal lays eggs  
animal is good flyer
```

use backward chaining to see if you can prove that the animal is

- (a) An ostrich
- (b) An albatross

Note that I don't just want the answer, what I want is for you to show the proof process that backward chaining goes through.

(20 points)

3. What sets of facts would suffice to establish that an animal was an ostrich?

(10 points)

4. Convert the following sentences to predicate logic form:

- (a) Every prime number other than 2 is odd.

- (b) Every cloud has a silver lining.
- (c) Nobody knows the trouble I seen.
- (d) Everybody hates punk music.
- (e) Everybody hates all punk music except that by Good Charlotte.

(20 points)

5. Let

$Days(x)$  mean that  $x$  is a day  
 $R(x)$  mean that  $x$  is rainy  
 $S(x)$  mean that  $x$  is sunny

Symbolise each of the following in two different ways:

- (a) Every day is sunny.
- (b) Some days are not sunny.
- (c) Every day that is not sunny is rainy.

(30 points)

### The Animals Rule Base

- R1: IF animal has hair  
THEN animal is a mammal
- R2: IF animal gives milk  
THEN animal is mammal
- R3: IF animal has feathers  
THEN animal is a bird
- R4: IF animal can fly  
AND animal lays eggs  
THEN animal is bird
- R5: IF animal eats meat  
THEN animal is carnivore

R6: IF animal has pointed teeth  
AND animal has claws  
THEN animal is carnivore

R7: IF animal is mammal  
AND animal has hoofs  
THEN animal is ungulate

R8: IF animal is mammal  
AND animal chews cud  
THEN animal is ungulate

R9: IF animal is mammal  
AND animal is carnivore  
AND animal has tawney colour  
AND animal has dark spots  
THEN animal is cheetah

R10: IF animal is mammal  
AND animal is carnivore  
AND animal has tawney colour  
AND animal has black stripes  
THEN animal is tiger

R11: IF animal is ungulate  
AND animal has long legs  
AND animal has dark spots  
THEN animal is giraffe

R12: IF animal is ungulate  
AND animal has black stripes  
THEN animal is zebra

R14: IF animal is bird  
AND animal does not fly  
AND animal has long legs  
AND animal has long neck  
THEN animal is ostrich

R14: IF animal is bird

AND animal does not fly  
AND animal can swim  
AND animal is black and white  
THEN animal is penguin

R15: IF animal is bird  
AND animal is good flyer  
THEN animal is albatross