

CMPUT 272 Winter 2001: Section B1

Quiz

Wednesday, Feb. 7

Time: 30 minutes

Weight: 10%

Total Points: 30

Last name:
First name:
Unix ID:

- This quiz is **open book**
- No calculators or other mechanical devices are allowed.
- This quiz should have 3 pages and 4 questions. You are responsible for checking that your exam booklet is complete.
- In the derivation questions you may only use basic rules of inference, (namely NE, NI, CE, CI, DE, DI, IE, II, EqE, EqI, RE, ContrI). Each step requires a justification (i.e. a reference to the formulas it is inferred from) and an annotation (i.e. the name of the inference rule used).

**Question 1 [8 points]**

Translate the following sentences into predicate logic using the predicates:

**Even(x)**: indicates that x is an even number.

**Odd(x)**: indicates that x is an odd number.

**Prime(x)**: indicates that x is a prime number.

**Div(x,y)**: indicates that x is evenly divisible by y. E.g.  $\text{Div}(6,2)$  is true since  $\frac{6}{2} = 3$ .

The universe of discourse consists of the integers  $\{\dots - 1, 0, 1, 2, 3 \dots 24 \dots\}$

**1.a [2 pts]:** 24 is divisible by the even number 2.

**1.b [2 pts]:** Any number which is divisible by 24 is also divisible by both 2 and 3.

**1.c [2 pts]:** Every prime number, except for 2, is odd.

**1.d [2 pts]:** Every even number is divisible by some odd number.

**Question 2 [8 points]** The following is a derivation. Provide justifications and annotations.

```

environ
  p0: A[] or B[];
  p1: A[] iff B[];
begin
  a0: now
    assume b0: not A[];
      b1: B[]          by [ ] ; == [ ]
      b2: A[]          by [ ] ; == [ ]
      thus contradiction by [ ] ; == [ ]
    end;
  a1: not not A[]     by [ ] ; == [ ]
  a2: A[]             by [ ] ; == [ ]
  a3: B[]             by [ ] ; == [ ]
  a4: A[] & B[]       by [ ] ; == [ ]

```

**Question 3 [6 points]** Show that  $\neg P \Rightarrow (Q \Rightarrow R)$  and  $(\neg P \Rightarrow Q) \Rightarrow R$  are not logically equivalent. Clearly indicate what evidence/reasoning you use to make this conclusion.

**Question 4 [8 points]** Give a derivation of  $B[]$  or  $\text{not } E[]$  given the premises below. Provide justifications and annotations.

environ

p0:  $E[]$  implies  $D[]$ ;

p1:  $\text{not } D[] \ \& \ \text{not } B[]$ ;

begin

Qu	Mark	
1		8
2		8
3		6
4		8
$\Sigma$		30

