

1. (10 points) State whether or not  $P \equiv Q$  for each pair of propositions  $P$  and  $Q$ .

(a)  $P = (p \rightarrow q) \rightarrow r, \quad Q = p \rightarrow (q \rightarrow r)$

(b)  $P = p \rightarrow q, \quad Q = \neg p \vee q$

2. (10 points) Let  $X = \{1, 2, \dots, 10\}$ . Define a relation  $R$  on  $X \times X$  by

$$(a, b)R(c, d) \quad \text{if } ad = bc.$$

- (a) Show that  $R$  is an equivalent relation on  $X \times X$ .
- (b) List the equivalent class of  $X \times X$  which contains  $(1, 2)$ .
3. Write the theta notation for the number of times the statement  $x = x + 1$  is executed in the problem

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for i=1 to n
  for j=1 to n
    for k=1 to i
      x=x+1
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The End