

Show all work clearly and in order, and circle your final answers. Justify your answers algebraically whenever possible; when you do use your calculator, sketch all relevant graphs and write down all relevant mathematics. You have 15 minutes to take this 15 point quiz.

1. (7 points) Use natural deduction prove the following statement:

$$(p \wedge (p \rightarrow q) \wedge (q \rightarrow r)) \rightarrow r$$

(You can use the textbook for the natural deduction inference rules. Or else let me know (raise your hand), I will have a handout for you. **Hint:** You are given three premises on the left and you have to prove the statement on the right.)

2. (8 points) (a) If $A = \{2, 5, 7, 8\}$, $B = \{2, 5, 4\}$ and $C = \{5, 10, 1\}$ show that the following statement is true,

$$(B - A) \cup (C - A) = (B \cup C) - A. \quad (2 \text{ points})$$

(b) Now, for arbitrary sets A, B and C give a proof that the above statement is true. You could use a membership table to prove this if you want.

(Try to write clearly and as formally as you can. Use symbols \in, \wedge, \vee as and when you need them. **Hint:** To prove $A = B$, you have to prove $A \subseteq B$ and $B \subseteq A$.) (3 + 3 points).)

Use backside of this page for you solution.