MATH 2001
QUIZ 4

1. (1 pt) Write your name in the top *right* corner of the page.
2. (12 pts) Arrange the statements below to form the body of a proof. The statements should be arranged so that each statement follows logically from the preceding statement.

   Each sentence in the proof should begin with a lettered statement and end with a numbered statement. The lettered statements may be used more than once; each numbered statement should be used exactly once.

   Write the letter and numeral in the boxes provided below. (You do not have to write out the complete statements.)

   Proof. Suppose that $X \in \mathscr{P}(A - B)$.

Sentence	Letter	Numeral
(2)	A	V
(3)	B	IV
(4)	C	I
(5)	B	VI
(6)	A	III
(7)	C	II

↑ the first sentence is up here

Sketch of proof:

$X \in \mathscr{P}(A - B)$

$\Rightarrow X \subseteq A - B$ (def of power set)

$\Rightarrow$ if $y \in X$, then $y \in A - B$ (def of subset)

$\Rightarrow$ if $y \in X$, then $y \in A$ and $y \notin B$ (def of difference)

(i.e. if $y \in X$, then $y \in A$, and if $y \in X$, then $y \notin B$)

$\Rightarrow X \subseteq A$ and $X \not\subseteq B$ (def of subset)

$\Rightarrow X \in \mathscr{P}(A)$ and $X \notin \mathscr{P}(B)$ (def of power set)

$\Rightarrow X \in \mathscr{P}(A) - \mathscr{P}(B)$ (def of difference).

□

A. By the definition of *power set* ...

B. By the definition of *subset* ...

C. By the definition of *set difference* ...

I. ... $y \in A$ and $y \notin B$.

II. ... $X \in \mathscr{P}(A) - \mathscr{P}(B)$.

III. ... $X \in \mathscr{P}(A)$ and $X \notin \mathscr{P}(B)$.

IV. ... if $y \in X$, then $y \in A - B$.

V. ... $X \subseteq A - B$.

VI. ... since $y \in X \Rightarrow y \in A$, we see that $X \subseteq A$, and since $y \in X \Rightarrow y \notin B$, we have $X \not\subseteq B$.

(*continued on back*)

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3. (2 pts) The proof on the front is a proof of what? Give an answer that does not involve X or y.

   The argument is a proof that $\mathscr{P}(A - B) \subseteq \mathscr{P}(A) - \mathscr{P}(B)$.

4. (2 pts) The proof on the front lacks an introduction. Write a short introduction for that proof (no more than three sentences) that explains what will be proved and how it will be proved.

   Suppose that A and B are sets. We prove that $\mathscr{P}(A - B) \subseteq \mathscr{P}(A) - \mathscr{P}(B)$ by showing that if $X \in \mathscr{P}(A - B)$, then $X \in \mathscr{P}(A) - \mathscr{P}(B)$.

Bonus: There is an error in proof/claim; +3 points if you can find and correct the error. (Either correct the proof, or correct the claim.)