

MA 225-001 Test 2

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Do any *five* of the following six problems.

1. Let A , B , C and D be sets. Prove: If $A \subseteq B$ and $C \subseteq \tilde{D}$, then $A \cap D \subseteq B - C$.
2. Let A and B be sets. Prove: If $B \subseteq A$, then $\tilde{A} \cap B = \emptyset$.
3. Suppose that for every $A \in \mathcal{A}$, either $A \subseteq B$ or $A \subseteq C$. Prove that

$$\bigcup_{A \in \mathcal{A}} A \subseteq B \cup C.$$

4. For each natural number n , let $A_n = (-\frac{1}{n}, n)$. Find $\bigcap_{n=1}^{\infty} A_n$ and $\bigcup_{n=1}^{\infty} A_n$.
5. Prove that for all natural numbers n ,
 $2 + 5 + 8 + \dots + (3n - 1) = \frac{1}{2}n(3n + 1)$.
6. Prove that for all natural numbers $n \geq 6$, $2^n > (1 + n)^2$.