ASSIGNMENT 2

MATH 303, FALL 2011

Instructions: *Do at least **3 points from each section** and at least **10 points total**. Up to 12 points will be graded, but your maximum score is 10. If you hand in more than 12 points please indicate which ones you want graded, otherwise the first 12 will be graded.*

Manipulation

(M1) **(1 point)** Let $E = \{a, b, d, q\}$. Let $A = \{a\}$ and let $B = \{b, d\}$. What is $(A' \cup B)'$?

(M2) **(1 point)** Let $A = \{1, \{3, 8\}, 4\}$ and $B = \{1, 2, 3, 4, 5, 6, 7, 8\}$. What is $A - B$?

(M3) **(1 point)** Is $\{\{\{\emptyset\}, \{\{\emptyset\}\}\}, \{\{\{\emptyset\}\}\}\}$ an ordered pair? If so, what are the first and second coordinates?

(M4) **(1 point)** Is $\{\{\{a, b\}, b\}\}$ an ordered pair? If so, what are the first and second coordinates?

(M5) **(2 points)** Let $A = \{a\}$ and $B = \{a, b\}$. Explicitly list the elements of $\mathcal{P}(\mathcal{P}(A \cup B))$ and circle those which are in $A \times B$.

Pure Math

(P1) **(3 points)** The 6 exercises on complementation from Halmos p18

(P2) **(4 points)** (*this is in Halmos on p21*) For any set E, what is $\bigcup \mathcal{P}(E)$? Under what conditions does $\bigcup \mathcal{P}(E) = \mathcal{P}(\bigcup E)$?

(P3) **(3 points)**

(a) Give an example to show that $A \times B \neq B \times A$ in general.

(b) Under what conditions does $A \times B = B \times A$?

Ideas

(I1) **(4 points)** Give a different definition of ordered pair (other than just swapping the coordinates). Explain why your definition still works, and describe what is better or worse about it compared to the usual definition.

(I2) **(2 points)** Look up (or remember) the sieve of Eratosthenes. Write down what it is using the notation $\bigcap \mathcal{C}$ for some $\mathcal{C}$.

(I3) **(3 points)** Compare De Morgan's laws for sets with De Morgan's laws in logic (look them up if you don't know them). Find where we implicitly used the logic version in the proof of De Morgan's laws for sets.