Assignment: 01

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Question 1

$M = \{\alpha, 3, \gamma\}, N = \{\blacksquare, \gamma, *, 0\}, K = \{\alpha, \{\alpha\}, M\}$

1.$M \cap N = \{\gamma\}$

2.$M \cap K = \{\alpha\}$

3.$P(M) \cap K$

$\mid M \mid = 3, P(M) = 2^{\mid} M \mid \Rightarrow 2^3 \Rightarrow 8$
$P(M) = \{\{\alpha, 3, \gamma\}, \{\alpha, 3\}, \{\alpha, \gamma\}, \{3, \gamma\}, \{\alpha\}, \{\gamma\}, \{3\}, \emptyset\}\}$
$P(M) \cap K = \{\{\alpha\}, M\}$

4.$M \setminus K = \{3, \gamma\}$

5.$N \cup k = \{\blacksquare, \gamma, *, 0, \alpha, \{\alpha\}, M\}$

Question 2

$prove : A \Delta B = (A \cup B) \cap \overline{(A \cap B)}$

$A \Delta B = (A \cup B) \cap \overline{(A \cap B)}$

$= (A \cap \overline{(A \cap B)}) \cup (B \cap \overline{(A \cap B)})$ **Distribution Low**

$= (A \cap (\overline{A} \cup \overline{B}) \cup (B \cap (\overline{A} \cup \overline{B}))$ **De Morgan's Low**

$= ((A \cap \overline{A}) \cup (A \cap \overline{B}) \cup (B \cap \overline{A}) \cup (B \cap \overline{B}))$

$= (\emptyset \cup (A \cap \overline{B})) \cup ((B \cap \overline{A}) \cup \emptyset)$ **Identity Low**

$= (A \cap \overline{B}) \cup (B \cap \overline{A})$ **[Proved]**

Question 3

$1. (4+5i)(4-5i)$

$= 16 - 20i + 20i - 25i^2$

$= 16 + 25$

$= 41$ **(Answer)**

$2. \frac{2+3i}{4+5i}$

$= \frac{(2+3i)(4-5i)}{(4+5i)(4-5i)}$

$= \frac{8-10i+12i-15i^2}{16-20i+20i-25i^2}$

$= \frac{8+2i+15}{16+25}$

$= \frac{23+2i}{41}$

$= \frac{23}{41} + \frac{2i}{41}$ **(Answer)**

$3. \sqrt{16b} + \sqrt{3a - 12a}$

$= \sqrt{16b} + \sqrt{-9a}$

$= 4\sqrt{b} + \sqrt{-1 * 9a}$

$= 4\sqrt{b} + 3i\sqrt{a}$

$= 4b^{\frac{1}{2}} + 3ia^{\frac{1}{2}}$ **(Answer)**

Question 4

$prove : f(A) \cap f(B) = f(A \cap B)$

Lets take,$y \epsilon f(A) \cap f(B)$

$So : y \epsilon f(A)$and $y \epsilon f(B)$

Since,$y \epsilon f(A)$ $\exists a \epsilon A$, Such that $y = f(A)$

$y \epsilon f(B)$ $\exists b \epsilon B$, Such that $y = f(B)$

So, $f(a) = f(b)$

Since f is injective, $a = b$, $a \epsilon A \cap B$

$$y = f(a) \epsilon f(A \cap B)$$

This shows, $f(A) \cap f(B) \subseteq f(A \cap B)$

Therefor, $f(A) \cap f(B) = f(A \cap B)$ **(Proved)**

Question 5