Formatif task (C): Show that $A \cap (\mathcal{U} \oplus A) = \emptyset$.

Res

$A \cap (\mathcal{U} \oplus A)$

$= A \cap ((\mathcal{U} \cap A^c) \cup (\mathcal{U}^c \cap A))$	Definition of $\oplus$
$= A \cap ((A^c \cap \mathcal{U}) \cup (\mathcal{U}^c \cap A))$	Commutativity of $\cap$
$= A \cap (A^c \cup (\mathcal{U}^c \cap A))$	Identity of $\cap$
$= A \cap (A^c \cup (\mathcal{U}^c \cap (A \cap \mathcal{U})))$	Identity of $\cap$
$= A \cap (A^c \cup (\mathcal{U}^c \cap (\mathcal{U} \cap A)))$	Commutativity of $\cap$
$= A \cap (A^c \cup ((\mathcal{U}^c \cap \mathcal{U}) \cap A))$	Associativity of $\cap$
$= A \cap (A^c \cup ((\mathcal{U} \cap \mathcal{U}^c) \cap A))$	Commutativity of $\cap$
$= A \cap (A^c \cup (\emptyset \cap A))$	Complement with $\cap$
$= A \cap ((A^c \cup \emptyset) \cap (A^c \cup A))$	Distributivity of $\cup$ over $\cap$
$= A \cap ((A^c \cup \emptyset) \cap (A \cup A^c))$	Commutativity of $\cup$
$= A \cap ((A^c \cup \emptyset) \cap \mathcal{U})$	Complement with $\cup$
$= A \cap (A^c \cup \emptyset)$	Identity of $\cap$
$= A \cap A^c$	Identity of $\cup$
$= \emptyset$	Complement with $\cap$