Write the following sentences in first-order logic using these literals: Has(Joe,x), Dog(x), Cat(x), Cute(x), Scary(x).

a) Joe has a cute dog.
   \[ \exists x \ (\text{Has}(\text{Joe},x) \land \text{Dog}(x) \land \text{Cute}(x)) \]

b) All of Joe’s dogs are cute.
   \[ \forall x \ ((\text{Has}(\text{Joe},x) \land \text{Dog}(x)) \implies \text{Cute}(x)) \]

c) Unless Joe has a dog, he is scary.
   \[ (\neg \exists x \ (\text{Has}(\text{Joe},x) \land \text{Dog}(x))) \implies \text{Scary(}\text{Joe}\text{)} \]

d) Either Joe has at least one cat and at least one dog or he is scary (but not both at the same time).
   \[ \exists x,y \ (\text{Has}(\text{Joe},x) \land \text{Has}(\text{Joe},y) \land \text{Dog}(x) \land \text{Cat}(y)) \iff \neg \text{Scary(}\text{Joe}\text{)} \]

e) Not all dogs are both scary and cute.
   \[ \neg \forall x \ (\text{Dog}(x) \implies (\text{Scary}(x) \land \text{Cute}(x))) \]