Translate the following English sentences into first-order logic formulas. Use
the language containing:

- Constant symbols: John and Mary.
- A unary function symbol: Mom, where Mom(x) denotes x’s mother.
- A binary predicate symbol: Likes, where Likes(x, y) means x likes y.
- A binary predicate symbol: BrotherOf, where BrotherOf(x, y) means
  x is a brother of y.

(“Anyone who ...” means the same as “every person who ...”.)

1. No one likes themself.
   \[ \forall x \neg \text{Likes}(x, x) \]

2. Mary likes everyone who does not like John.
   \[ \forall x (\neg \text{Likes}(x, \text{John}) \rightarrow \text{Likes}(\text{Mary}, x)) \]

3. Everyone likes their mother.
   \[ \forall x (\text{Likes}(x, \text{Mom}(x))) \]

4. Everyone likes their mother’s mother.
   \[ \forall x (\text{Likes}(x, \text{Mom} (\text{Mom}(x)))) \]

5. Everyone likes the mothers of all their brothers.
   \[ \forall x \forall y (\text{BrotherOf}(y, x) \rightarrow \text{Likes}(x, \text{Mom}(y))) \]

6. Anyone who likes no one is liked by no one.
   \[ \forall x (\forall y \neg \text{Likes}(x, y) \rightarrow \forall y \neg \text{Likes}(y, x)) \]

7. Anyone with no brothers likes their mother.
   \[ \forall x (\neg \exists y \text{BrotherOf}(y, x) \rightarrow \text{Likes}(x, \text{Mom}(x))) \]

8. Mary is not the mother of John.
   \[ \text{Mary} \neq \text{Mom}(\text{John}) \]

9. No one is their own mother.
   \[ \forall x (x \neq \text{Mom}(x)) \]

10. There is someone with at least two brothers.
    \[ \exists x \exists y \exists z (\text{BrotherOf}(y, x) \land \text{BrotherOf}(z, x) \land y \neq z) \]