Predicate Logic – Exercises for Week 6

Domain of quantification: {x: x is a philosopher}[1]

Names:	a	Alonzo
	b	Bertrand
	c	Charles
	d	Donald

Predicates:	Px	x smokes a pipe
	Sx	x wears slippers
	Dxy	x despises y

1. Formalize the following as predicate formulae:

i. Bertrand smokes a pipe, but Alonzo does not.
ii. All the pipe-smokers wear slippers.
iii. No philosopher who wears slippers smokes a pipe.
iv. Only the pipe-smokers wear slippers.
v. Everyone who wears slippers despises Donald.
vi. Donald despises everyone who smokes a pipe.
vii. Bertrand and Charles both despise Donald, but they don't despise Alonzo.
viii. Bertrand despises only those philosophers who don't smoke a pipe.
ix. Donald despises all pipe-smokers and anyone who wears slippers.
x. If all philosophers smoke pipes, then some philosophers wear slippers.
xi. Everyone who smokes a pipe wears slippers.
xii. No pipe-smoker wears slippers.
xiii. No one who wears slippers smokes a pipe.
xiv. Everyone either smokes a pipe or wears slippers.
xv. Alonzo and Charles despise someone who wears slippers.
xvi. No pipe-smoker despises everyone who wears slippers.
xvii. No pipe-smoker despises anyone who wears slippers.
xviii. If everyone wears slippers, then Bertrand does.
xix. If anyone wears slippers, then Bertrand does.
xx. If nobody smokes a pipe, then nobody smokes a pipe and wears slippers.

2. Translate the following into idiomatic English:

i. $\forall x[Sx \rightarrow \neg Px]$
ii. $[Dab \wedge \neg Dba]$
iii. $\exists x[Sx \wedge \neg Px]$
iv. $\exists xDxb$
v. $\exists xDbx$
vi. $[\forall xDxx \rightarrow \exists xDxc]$
vii. $\forall x[Dxx \rightarrow Dxb]$
viii. $\exists x[Sx \wedge Dxa]$
ix. $[\forall x\neg Sx \rightarrow \forall x\neg Px]$
x. $\forall x[\neg Sx \rightarrow \neg Px]$
xi. $\forall x\exists yDxy$
xii. $\exists y\forall xDxy$

3. Do exercise 26.2 from the Logic Exercises booklet.

[1] This can be read as 'the set of all things *x* such that *x* is a philosopher', i.e., it's the set of all philosophers.