Exercise 9.1. Show that any query expressible in Datalog can be expressed as a safe Datalog query.

Exercise 9.2. Show that the inferences under stratified negation and under classical logical semantics do not coincide.

Exercise 9.3. Show how to express the following SPARQL features in (stratified) Datalog:

- property path expressions,

- UNION,

- MINUS, and

- NOT EXISTS.

Exercise 9.4. Compute a stratification for the following Datalog program:

$$\mathsf{mother}(x, y) :- \mathsf{triple}(x, \mathtt{wdt{:}P25}, y)$$
$$\mathsf{father}(x, y) :- \mathsf{triple}(x, \mathtt{wdt{:}P22}, y)$$
$$\mathsf{notSameMother}(x, y) :- \mathsf{mother}(x, z), \neg\mathsf{mother}(y, z)$$
$$\mathsf{sameFather}(x, y) :- \mathsf{father}(x, z), \mathsf{father}(y, z)$$
$$\mathsf{notSameFather}(x, y) :- \neg\mathsf{sameFather}(x, y)$$
$$\mathsf{sameMother}(x, y) :- \neg\mathsf{notSameMother}(x, y)$$
$$\mathsf{halfSiblings}(x, y) :- \mathsf{sameMother}(x, y), \mathsf{notSameFather}(x, y)$$
$$\mathsf{halfSiblings}(x, y) :- \mathsf{sameFather}(x, y), \mathsf{notSameMother}(x, y)$$