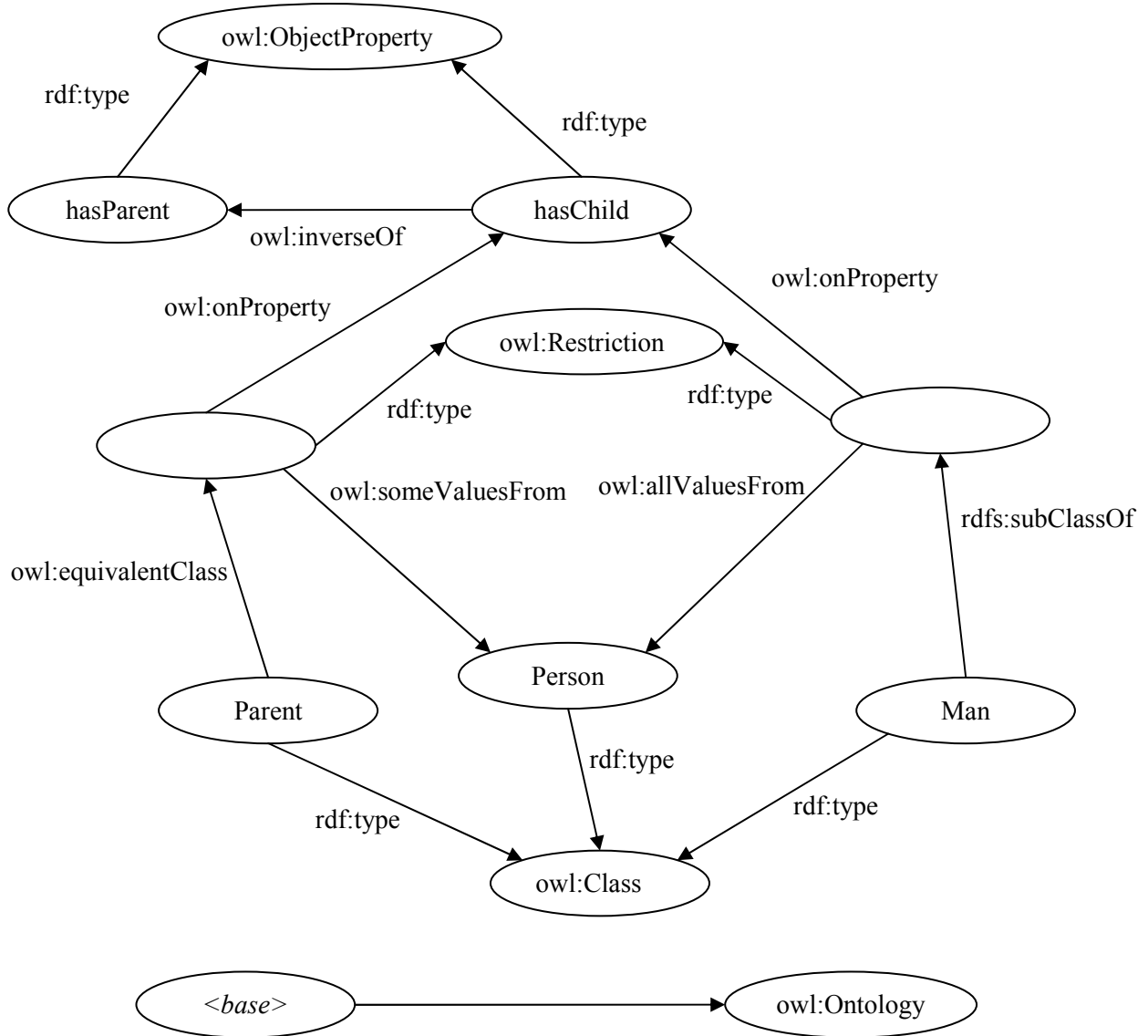


Homework #2 Solutions

1. (25 pts., not graded) Note, this exercise has an unusual class definition (All Men only have Persons as children), but that doesn't change the RDF graph. Also, note that the document does not have an `xml:base`, but I did not identify the URL where the document was accessed from. I use `<base>` below to refer to this unknown URL and to distinguish it from an anonymous node.



2. (15 pts.)

```

<owlClass rdf:about="#Man" />
  <rdfs:subClassOf>
    <owl:Class>
      <owl:complementOf rdf:resource="#Woman" />
    </owl:Class>
  </rdfs:subClassOf>
</owl:Class>

```

```

<owlClass rdf:about="http://www.w3.org/2002/07/owl#Nothing" />
  <owl:intersectionOf rdf:parseType="Collection">
    <owl:Class rdf:about="#Man" />
    <owl:Class rdf:about="#Woman" />
  </owl:intersectionOf>
</owl:Class>

```

Also acceptable variation:

```

<owlClass rdf:about="http://www.w3.org/2002/07/owl#Nothing" />
  <owl:equivalentClass>
    <owl:Class>
      <owl:intersectionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#Man" />
        <owl:Class rdf:about="#Woman" />
      </owl:intersectionOf>
    </owl:Class>
  </owl:equivalentClass>
</owl:Class>

```

3. (30 pts. total)

a) (7 pts.)

```

<owl:Class rdf:about="#A" />
  <owl:intersectionOf rdf:parseType="Collection">
    <owl:Class rdf:about="#B" />
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#C" />
        <owl:Class rdf:about="#D" />
      </owl:unionOf>
    </owl:Class>
  </owl:intersectionOf>
</owl:Class>

```

b) (7 pts., not graded)

```

<owl:Class rdf:about="#A" />
  <rdfs:subClassOf>
    <owl:Restriction>
      <owl:onProperty>
        <owl:ObjectProperty>
          <owl:inverseOf rdf:resource="#P" />
        </owl:ObjectProperty>
      </owl:onProperty>
      <owl:someValuesFrom rdf:resource="#C" />
    </owl:Restriction>
  </rdfs:subClassOf>
</owl:Class>

```

c) (8 pts.)

```

<owl:Class>
  <owl:complementOf rdf:resource="#A" />
  <rdfs:subClassOf>
    <owl:Class>
      <owl:intersectionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#B" />
        <owl:Restriction>
          <owl:onProperty rdf:resource="#P" />
          <owl:hasValue rdf:resource="#a" />
        </owl:Restriction>
      </owl:intersectionOf>
    </owl:Class>
  </rdfs:subClassOf>
</owl:Class>

```

d) (8 pts. not graded)*Note, the description below assumes &xsd; entity is defined*

```

<owl:Restriction>
  <owl:onProperty rdf:resource="#P" />
  <owl:allValuesFrom>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="#B" />
        <owl:Class rdf:about="#C" />
      </owl:unionOf>
    </owl:Class>
  </owl:allValuesFrom>
  <owl:equivalentClass>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#R" />
      <owl:maxCardinality rdf:datatype="&xsd;nonNegativeInteger">
        2</owl:maxCardinality>
    </owl:Restriction>
  </owl:equivalentClass>
</owl:Restriction>

```

Alternative:

```

<owl:Class>
  <owl:equivalentClass>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#P" />
      <owl:allValuesFrom>
        <owl:Class>
          <owl:unionOf rdf:parseType="Collection">
            <owl:Class rdf:about="#B" />
            <owl:Class rdf:about="#C" />
          </owl:unionOf>
        </owl:Class>
      </owl:allValuesFrom>
    </owl:Restriction>
  </owl:equivalentClass>
  <owl:equivalentClass>
    <owl:Restriction>
      <owl:onProperty rdf:resource="#R" />
      <owl:maxCardinality rdf:datatype="&xsd;nonNegativeInteger">
        2</owl:maxCardinality>
    </owl:Restriction>
  </owl:equivalentClass>
</owl:Class>

```

4. (30 pts., 10 pts. each)

This problem can be solved by using the semantic conditions and the interpretations to construct interpretations of class expressions.

a) I_2 and I_3

$$I_1: \{a,b\} \not\subseteq \{\}$$

$$I_2: \{a\} \subseteq \{a,d\}$$

$$I_3: \{b,c,d\} \subseteq \{a,b,c,d\}$$

b) I_1 and I_3

	$(A)^I$	$(B)^I$	$(\forall P.C)^I$	$(B \sqcap \forall P.C)^I$
I_1	$\{\}$	$\{a,b\}$	$\{a,b,c,d\}$	$\{a,b\}$
I_2	$\{a\}$	$\{a\}$	$\{b,c,d\}$	\emptyset
I_3	$\{b,c\}$	$\{b,c,d\}$	$\{a,b,c,d\}$	$\{b,c,d\}$

Note, remember that $\forall P.C$ is trivially satisfied for any instance x that does not have any values for p

c) I_1 and I_2

	$(D)^I$	$(B)^I$	$(\exists P.C)^I$	$(B \sqcup \exists P.C)^I$
I_1	$\{\}$	$\{a,b\}$	$\{\}$	$\{a,b\}$
I_2	$\{a,b\}$	$\{a\}$	$\{a,b\}$	$\{a,b\}$
I_3	$\{a,b,c,d\}$	$\{b,c,d\}$	$\{b,d\}$	$\{b,c,d\}$