Assignment 6

Due Monday, October 24, 2016 by 11:59pm

Consider the following relation schemas about students and books.

Student($\underline{Sid}, Sname$)
Major($\underline{Sid, Major}$)
Book($\underline{BookNo}, Title, Price$)
Cites($\underline{BookNo, CitedBookNo}$)
Buys($\underline{Sid, BookNo}$)

The relation Major stores students and their majors. A student can have multiple majors, but we also allow that a student can have no major. A tuple (b, c) in the relation Cites indicates that the book with book number b cites the book with book number c. Note that a book may cite multiple other books. Also, a book does not have to cited.

Translate the following SQL queries into equivalent RA expressions. Subsequently, optimize these RA expressions as much as possible. Show your work.

1.
```
SELECT  b.bookno, c1.bookno
FROM book b, cites c1, cites c2
WHERE   b.bookno = c1.citedbookno AND
        c1.bookno = c2.citedbookno
        b.bookno = 10 AND c2.citedbookno <> 20;
```

2.
```
SELECT b.bookno FROM book b
WHERE  b.Title = 'AI' AND EXISTS(SELECT b1.bookno
                                 FROM book b1
                                 WHERE b1.Price < b.Price);
```

3.
```
SELECT b.bookno
FROM book b
WHERE b.bookno NOT IN (SELECT T.bookno
                       FROM buys T);
```

4.
```
SELECT b.bookno FROM book b
WHERE NOT EXISTS(SELECT b1.bookno
                 FROM book b1
                 WHERE b1.Price < b.Price);
```

5.
```
SELECT b.bookno FROM book b
WHERE  b.Title = 'AI' AND b.bookno NOT IN (SELECT c.citedbookno
                                           FROM cites c, book b1
                                           WHERE c.bookno = b1.bookno AND
                                                 b1.Title = 'OS');
```

6.
```
SELECT s.sid
FROM student s, major m
WHERE s.sid = m.sid AND m.major = 'CS'
      NOT EXISTS( (SELECT T.bookno
                   FROM buys T
                   WHERE s.sid = T.sid AND s.Sname <> 'John')
                   INTERSECT
                  (SELECT b.bookno
                   FROM book b
                   WHERE b.Price < 30));
```

7.
```
SELECT  s1.sid
FROM student s1, student s2
WHERE s1.sid <> s2.sid AND
     EXISTS(SELECT T1.bookno
            FROM buys T1
            WHERE  s1.Sname = 'John' AND s1.sid = T1.sid AND
                   T1.bookno IN (SELECT T2.bookno
                                 FROM buys T2
                                 WHERE  s2.sid = T2.sid));
```