SQL: Outer Joins etc.

Schema

Student(sID, surName, firstName, campus, email, cgpa)  Offering[dept, cNum] ⊆ Course[dept, cNum]
Course(dept, cNum, name, breadth)  Took[sID] ⊆ Student[sID]
Offering(oID, dept, cNum, term, instructor)  Took[oID] ⊆ Offering[oID]
Took(sID, oID, grade)

Questions

1. Which of these queries is legal?

   (a) SELECT count(distinct dept), count(distinct instructor)
       FROM Offering
       WHERE term >= 20089;

   (b) SELECT distinct dept, distinct instructor
       FROM Offering
       WHERE term >= 20089;

   (c) SELECT distinct dept, instructor
       FROM Offering
       WHERE term >= 20089;

2. Under what conditions could these two queries give different results? If that is not possible, explain why.

   \[
   \begin{align*}
   \text{SELECT surName, campus} & \quad \text{SELECT distinct surName, campus} \\
   \text{FROM Student;} & \quad \text{FROM Student;}
   \end{align*}
   \]

3. For each student who has taken a course, report their sid and the number of different departments they have taken a course in.
4. Suppose we have two tables with content as follows:

```sql
SELECT *
FROM One;
```

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

(4 rows)

```sql
SELECT *
FROM Two;
```

<table>
<thead>
<tr>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>101</td>
</tr>
<tr>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

(5 rows)

(a) What query could produce this result?

```sql
SELECT a, b, b AS c
FROM One
UNION
SELECT a, b, c
FROM Two;
```

(b) What query could produce this result?

```sql
SELECT a, b, c
FROM One
UNION
SELECT a, b, c
FROM Two
WHERE b = 2;
```