

Федеральное государственное автономное образовательное учреждение высшего
образования

«Национальный исследовательский университет ИТМО»

Факультет инфокоммуникационных технологий

ОТЧЕТ О ЛАБОРАТОРНОЙ РАБОТЕ №4 ПО ТЕМЕ:
«ЗАПРОСЫ НА ВЫБОРКУ ДАННЫХ К БД POSTGRESQL.
ПРЕДСТАВЛЕНИЯ В POSTGRESQL»

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Цель работы: овладеть практическими навыками создания представлений и запросов на выборку данных к базе данных PostgreSQL и использования подзапросов при модификации данных.

Оборудование: компьютерный класс.

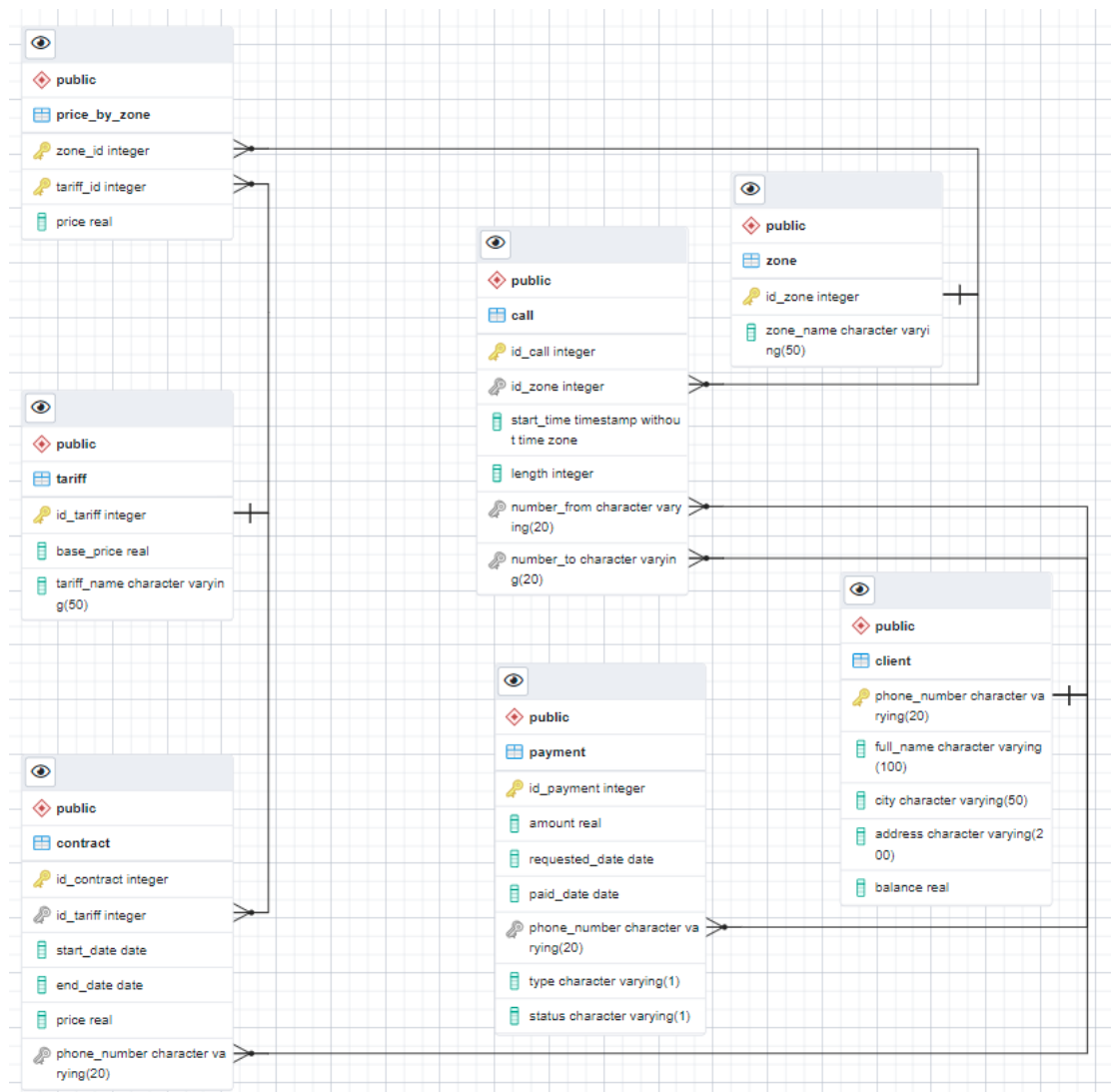
Программное обеспечение: СУБД PostgreSQL, pgadmin 4.

Практическое задание:

1. Создать запросы и представления на выборку данных к базе данных PostgreSQL (согласно индивидуальному заданию, часть 2 и 3).
2. Составить 3 запроса на модификацию данных (INSERT, UPDATE, DELETE) с использованием подзапросов.
3. Изучить графическое представление запросов.
4. Просмотреть историю запросов.

Выполнение:

Схема логической модели базы данных, сгенерированная в Generate ERD:



Создание запросов:

1. Вывести суммарное время переговоров каждого абонента за заданный период.

```
1 select "number", sum(s) as total_length_mins
2 from
3     (select number_from as "number", sum("length") as s
4     from "call"
5     where start_time between '2021-06-01' and '2021-06-30'
6     group by number_from
7     union
8     select number_to as "number", sum("length") as s
9     from "call"
10    where start_time between '2021-06-01' and '2021-06-30'
11    group by number_to) as f
12 group by "number"
13 order by total_length_mins desc
```

Data Output Explain Messages Notifications

	number character varying (20)	total_length_mins numeric	
1	+7 (111) 111-11-11	85	
2	+7 (999) 999-99-95	80	
3	+7 (999) 999-99-99	70	
4	+7 (123) 456-78-90	35	
5	+7 (222) 222-22-22	10	
6	+7 (333) 333-33-33	0	
7	+7 (444) 444-44-44	0	

2. Найти среднюю продолжительность разговора абонента АТС.

```
1 select trunc(avg(length), 2) as avg_length_mins
2 from call
```

Data Output Explain Messages Notifications

	avg_length_mins numeric	
1	15.55	

3. Вывести количество междугородных переговоров каждого абонента.

```

1 select "number", sum(c) as calls_count
2 from
3     (select number_from as "number", count(*) as c
4     from "call" natural join zone
5     where zone_name like 'intercity'
6     group by number_from
7     union
8     select number_to as "number", count(*) as c
9     from "call" natural join zone
10    where zone_name like 'intercity'
11    group by number_to) as f
12 group by "number"
13 order by calls_count desc

```

Data Output Explain Messages Notifications

	number character varying (20)	calls_count numeric	
1	+7 (111) 111-11-11	3	
2	+7 (999) 999-99-95	2	
3	+7 (999) 999-99-99	1	

4. Вывести список абонентов, не внесших оплату за прошедший месяц.

```

1 select phone_number, full_name
2 from client
3 where phone_number not in
4 (
5     select distinct phone_number from payment
6     where requested_date > current_date - interval '1 month'
7     and "type" like 'T'
8     and status like 'O'
9 )

```

Data Output Explain Messages Notifications

	phone_number [PK] character varying (20)	full_name character varying (100)	
1	+7 (999) 999-99-95	Sidorov Petr	
2	+7 (333) 333-33-33	Elizabeth II	
3	+7 (444) 444-44-44	Sherlock Holmes	
4	+7 (555) 555-55-55	Litvak Igor	
5	+7 (111) 111-11-11	Pertova Masha	
6	+7 (123) 456-78-90	Smirnov Vasya	

5. Сколько звонков было сделано в каждый из следующих городов: в Москву, Лондон, Париж.

```

1 select city, count(*) as calls_count
2 from "call" join client
3 on number_to = phone_number
4 group by city
5 having city in ('Moscow', 'London', 'Paris')
6 order by calls_count desc

```

Data Output Explain Messages Notifications

	city character varying (50)	calls_count bigint	
1	Moscow	5	
2	London	1	
3	Paris	1	

6. Вывести список абонентов, звонивших только в ночное время.

```

1 select distinct number_from from call
2 where number_from not in
3 (
4     select number_from
5     from call
6     where extract(hour from start_time) not between 0 and 6
7 )

```

Data Output Explain Messages Notifications

	number_from character varying (20)	
1	+7 (444) 444-44-44	
2	+7 (999) 999-99-95	

- Вывести список абонентов, время разговоров которых превышает среднее для этой же зоны.

```

1 select "number", zone_name, "length",
2 trunc((select avg("length") from "call" where "call".id_zone = f.id_zone), 2) as zone_average
3 from
4 (
5     select number_from as "number", id_zone, "length"
6     from "call"
7     union
8     select number_to as "number", id_zone, "length"
9     from "call"
10 ) as f
11 join zone on zone.id_zone = f.id_zone
12 where "length" > (select avg("length") from "call" where "call".id_zone = id_zone)

```

Data Output Explain Messages Notifications

	number character varying (20)	zone_name character varying (50)	length integer	zone_average numeric	
1	+7 (999) 999-99-99	city	30	15.00	
2	+7 (999) 999-99-95	intercity	35	16.66	
3	+7 (999) 999-99-95	city	30	15.00	
4	+7 (111) 111-11-11	intercity	35	16.66	
5	+7 (123) 456-78-90	intentional	35	15.00	
6	+7 (111) 111-11-11	intentional	35	15.00	

Создание представлений:

- Содержащее сведения обо всех абонентах и их переговорах за прошедший месяц.

```

1 create view last_month as
2 select c1.full_name as caller, c1.phone_number as caller_number,
3 c2.full_name as reciever, c2.phone_number as reciever_number,
4 start_time, "length" as length_mins
5 from "call"
6 join client c1 on number_from = c1.phone_number
7 join client c2 on number_to = c2.phone_number
8 where start_time > current_date - interval '1 month';
9
10 select * from last_month

```

Data Output Explain Messages Notifications

	caller character varying (100)	caller_number character varying (20)	reciever character varying (100)	reciever_number character varying (20)	start_time timestamp without time zone	length_mins integer
1	Ivanov Ivan	+7 (999) 999-99-99	Sidorov Petr	+7 (999) 999-99-95	2021-05-31 09:00:00	10
2	Ivanov Ivan	+7 (999) 999-99-99	Sidorov Petr	+7 (999) 999-99-95	2021-05-31 09:10:00	30
3	Pertova Masha	+7 (111) 111-11-11	Ivanov Ivan	+7 (999) 999-99-99	2021-06-01 18:00:00	15
4	Pertova Masha	+7 (111) 111-11-11	Sidorov Petr	+7 (999) 999-99-95	2021-06-01 20:00:00	0
5	Pertova Masha	+7 (111) 111-11-11	Sidorov Petr	+7 (999) 999-99-95	2021-06-01 21:00:00	35
6	Smirnov Vasya	+7 (123) 456-78-90	Pertova Masha	+7 (111) 111-11-11	2021-06-01 13:00:00	35
7	Ivanov Ivan	+7 (999) 999-99-99	Napoleon	+7 (222) 222-22-22	2021-06-21 00:00:00	10
8	Sherlock Holmes	+7 (444) 444-44-44	Elizabeth II	+7 (333) 333-33-33	2021-06-21 00:00:00	0
9	Sidorov Petr	+7 (999) 999-99-95	Ivanov Ivan	+7 (999) 999-99-99	2021-06-22 00:00:00	5

- Найти самую популярную зону звонков.

```

1 create view popular_zone as
2 select zone_name, count(*) as n
3 from "call" natural join zone
4 group by zone_name
5 having count(*) =
6 (
7     select count(*) as n
8     from "call" natural join zone
9     group by zone_name
10    order by count(*) desc
11    limit 1
12 );
13
14 select * from popular_zone;

```

Data Output Explain Messages Notifications

	zone_name character varying (50)	n bigint
1	city	3
2	intercity	3
3	international	3

Создание запросов на модификацию данных:

1. Добавление нового пользователя

До:

```

1 select * from client

```

Data Output Explain Messages Notifications

	phone_number [PK] character varying (20)	full_name character varying (100)	city character varying (50)	address character varying (200)	balance real
1	+7 (999) 999-99-99	Ivanov Ivan	Ivanovo	ulitsa Ivanovskaya	1000
2	+7 (999) 999-99-95	Sidorov Petr	Moscow	Lenina st.	0
3	+7 (123) 456-78-90	Smirnov Vasya	St. Petersburg	Nevsky prospekt	300
4	+7 (111) 111-11-11	Pertova Masha	Moscow	Gagarina st.	-100
5	+7 (222) 222-22-22	Napoleon	Paris	Louvre	100000
6	+7 (333) 333-33-33	Elizabeth II	London	Buckingham Palace	200000
7	+7 (444) 444-44-44	Sherlock Holmes	London	Baker Street	-300

После:

```

1 insert into client (phone_number, full_name, city, address, balance)
2 values ('+7 (555) 555-55-55', 'Litvak Igor', 'St. Petersburg', 'Kronverksky prospekt', 0);
3
4 select * from client;

```

	phone_number [PK] character varying (20)	full_name character varying (100)	city character varying (50)	address character varying (200)	balance real
1	+7 (999) 999-99-99	Ivanov Ivan	Ivanovo	ulitsa Ivanovskaya	1000
2	+7 (999) 999-99-95	Sidorov Petr	Moscow	Lenina st.	0
3	+7 (123) 456-78-90	Smirnov Vasya	St. Petersburg	Nevsky prospekt	300
4	+7 (111) 111-11-11	Pertova Masha	Moscow	Gagarina st.	-100
5	+7 (222) 222-22-22	Napoleon	Paris	Louvre	100000
6	+7 (333) 333-33-33	Elizabeth II	London	Buckingham Palace	200000
7	+7 (444) 444-44-44	Sherlock Holmes	London	Baker Street	-300
8	+7 (555) 555-55-55	Litvak Igor	St. Petersburg	Kronverksky prospekt	0

2. Создание контракта по названию тарифа и имени пользователя

До:

```

1 select * from contract

```

	id_contract [PK] integer	id_tariff integer	start_date date	end_date date	price real	phone_number character varying (20)
1	1	1	2020-01-01	[null]	1000	+7 (111) 111-11-11
2	2	2	2018-03-10	[null]	150	+7 (123) 456-78-90
3	3	1	2019-09-09	2029-09-09	900	+7 (999) 999-99-95
4	4	3	2021-01-01	[null]	5000	+7 (999) 999-99-99
5	5	3	2021-06-20	2025-06-20	5000	+7 (222) 222-22-22
6	6	3	2011-01-01	2021-01-01	5000	+7 (333) 333-33-33
7	7	2	2021-06-20	2025-06-20	200	+7 (444) 444-44-44

После:

```

1 insert into contract (id_contract, id_tariff, start_date, end_date, price, phone_number)
2 values
3 (
4     8,
5     (select id_tariff from tariff where tariff_name like '10000 minutes 10000 Gb'),
6     '2021-06-20',
7     NULL,
8     (select base_price from tariff where tariff_name like '10000 minutes 10000 Gb'),
9     (select phone_number from client where full_name like 'Litvak Igor')
10 );
11
12 select * from contract;

```

	id_contract [PK] integer	id_tariff integer	start_date date	end_date date	price real	phone_number character varying (20)
1	1	1	2020-01-01	[null]	1000	+7 (111) 111-11-11
2	2	2	2018-03-10	[null]	150	+7 (123) 456-78-90
3	3	1	2019-09-09	2029-09-09	900	+7 (999) 999-99-95
4	4	3	2021-01-01	[null]	5000	+7 (999) 999-99-99
5	5	3	2021-06-20	2025-06-20	5000	+7 (222) 222-22-22
6	6	3	2011-01-01	2021-01-01	5000	+7 (333) 333-33-33
7	7	2	2021-06-20	2025-06-20	200	+7 (444) 444-44-44
8	8	1	2021-06-20	[null]	1000	+7 (555) 555-55-55

3. Подарить 100 бонусных рублей пользователям, совершившим за июнь звонков суммарно не менее чем на 30 минут

До:

```
1 select * from client
```

	phone_number [PK] character varying (20)	full_name character varying (100)	city character varying (50)	address character varying (200)	balance real
1	+7 (999) 999-99-99	Ivanov Ivan	Ivanovo	ulitsa Ivanovskaya	1000
2	+7 (999) 999-99-95	Sidorov Petr	Moscow	Lenina st.	0
3	+7 (123) 456-78-90	Smirnov Vasya	St. Petersburg	Nevsky prospekt	300
4	+7 (111) 111-11-11	Pertova Masha	Moscow	Gagarina st.	-100
5	+7 (222) 222-22-22	Napoleon	Paris	Louvre	100000
6	+7 (333) 333-33-33	Elizabeth II	London	Buckingham Palace	200000
7	+7 (444) 444-44-44	Sherlock Holmes	London	Baker Street	-300
8	+7 (555) 555-55-55	Litvak Igor	St. Petersburg	Kronverksky prospekt	0

После:

```
1 update client
2 set balance = balance + 100
3 where phone_number in
4 (
5     select number_from
6     from "call"
7     where start_time between '2021-06-01' and '2021-06-30'
8     group by number_from
9     having sum("length") >= 30
10 );
11
12 select * from client;
```

	phone_number [PK] character varying (20)	full_name character varying (100)	city character varying (50)	address character varying (200)	balance real
1	+7 (999) 999-99-99	Ivanov Ivan	Ivanovo	ulitsa Ivanovskaya	1000
2	+7 (999) 999-99-95	Sidorov Petr	Moscow	Lenina st.	0
3	+7 (222) 222-22-22	Napoleon	Paris	Louvre	100000
4	+7 (333) 333-33-33	Elizabeth II	London	Buckingham Palace	200000
5	+7 (444) 444-44-44	Sherlock Holmes	London	Baker Street	-300
6	+7 (555) 555-55-55	Litvak Igor	St. Petersburg	Kronverksky prospekt	0
7	+7 (111) 111-11-11	Pertova Masha	Moscow	Gagarina st.	0
8	+7 (123) 456-78-90	Smirnov Vasya	St. Petersburg	Nevsky prospekt	400

4. В договорах без даты истечения установить ее как 2030-01-01








До:

```
1 select * from contract
```

	id_contract [PK] integer	id_tariff integer	start_date date	end_date date	price real	phone_number character varying (20)
1	1	1	2020-01-01	[null]	1000	+7 (111) 111-11-11
2	2	2	2018-03-10	[null]	150	+7 (123) 456-78-90
3	3	1	2019-09-09	2029-09-09	900	+7 (999) 999-99-95
4	4	3	2021-01-01	[null]	5000	+7 (999) 999-99-99
5	5	3	2021-06-20	2025-06-20	5000	+7 (222) 222-22-22
6	6	3	2011-01-01	2021-01-01	5000	+7 (333) 333-33-33
7	7	2	2021-06-20	2025-06-20	200	+7 (444) 444-44-44
8	8	1	2021-06-20	[null]	1000	+7 (555) 555-55-55

После:









```
1 update contract
2 set end_date = '2030-01-01'
3 where end_date is NULL;
4
5 select * from contract;
```

Data Output		Explain	Messages	Notifications								
	id_contract [PK] integer		id_tariff integer		start_date date		end_date date		price real		phone_number character varying (20)	
1		3		1	2019-09-09		2029-09-09		900		+7 (999) 999-99-95	
2		5		3	2021-06-20		2025-06-20		5000		+7 (222) 222-22-22	
3		6		3	2011-01-01		2021-01-01		5000		+7 (333) 333-33-33	
4		7		2	2021-06-20		2025-06-20		200		+7 (444) 444-44-44	
5		1		1	2020-01-01		2030-01-01		1000		+7 (111) 111-11-11	
6		2		2	2018-03-10		2030-01-01		150		+7 (123) 456-78-90	
7		4		3	2021-01-01		2030-01-01		5000		+7 (999) 999-99-99	
8		8		1	2021-06-20		2030-01-01		1000		+7 (555) 555-55-55	

5. Удалить из истории оплат операции заверенные раньше мая 2021









До:

```
1 select * from payment
```

Data Output		Explain	Messages	Notifications					
	 id_payment [PK] integer	 amount real	 requested_date date	 paid_date date	 phone_number character varying (20)	 type character varying (1)	 status character varying (1)		
1	1	1000	2021-02-10	2021-02-10	+7 (999) 999-99-99	П	О		
2	2	-200	2021-02-11	2021-02-11	+7 (999) 999-99-99	Т	О		
3	3	-15	2021-02-12	2021-02-12	+7 (999) 999-99-99	З	О		
4	4	-25	2021-02-12	2021-02-12	+7 (999) 999-99-99	З	О		
5	5	-10	2021-02-14	2021-02-14	+7 (999) 999-99-99	З	О		
6	6	-5000	2021-03-14	[null]	+7 (999) 999-99-99	Т	Н		
7	7	-150	2021-05-15	[null]	+7 (111) 111-11-11	Т	Н		
8	8	-10	2021-05-20	2021-05-20	+7 (123) 456-78-90	З	О		
9	9	-10	2021-05-20	2021-05-20	+7 (123) 456-78-90	З	О		
10	10	-10	2021-05-20	2021-05-20	+7 (123) 456-78-90	З	О		
11	11	10000	2021-05-20	2021-05-20	+7 (123) 456-78-90	П	О		
12	12	100000	2021-06-21	2021-06-21	+7 (222) 222-22-22	П	О		
13	13	-200	2021-06-21	[null]	+7 (444) 444-44-44	Т	Н		
14	14	-200	2021-06-10	2021-06-11	+7 (999) 999-99-99	Т	О		
15	15	-5000	2021-06-21	2021-06-21	+7 (222) 222-22-22	Т	О		

После:

```
1 delete from payment
2 where paid_date < '2021-05-01' and status like 'O';
3
4 select * from payment;
```

Data Output		Explain	Messages	Notifications					
	 id_payment [PK] integer 	amount real 	requested_date date 	paid_date date 	phone_number character varying (20) 	type character varying (1) 	status character varying (1) 		
1	6	-5000	2021-03-14	[null]	+7 (999) 999-99-99	T	H		
2	7	-150	2021-05-15	[null]	+7 (111) 111-11-11	T	H		
3	8	-10	2021-05-20	2021-05-20	+7 (123) 456-78-90	3	O		
4	9	-10	2021-05-20	2021-05-20	+7 (123) 456-78-90	3	O		
5	10	-10	2021-05-20	2021-05-20	+7 (123) 456-78-90	3	O		
6	11	10000	2021-05-20	2021-05-20	+7 (123) 456-78-90	П	O		
7	12	100000	2021-06-21	2021-06-21	+7 (222) 222-22-22	П	O		
8	13	-200	2021-06-21	[null]	+7 (444) 444-44-44	T	H		
9	14	-200	2021-06-10	2021-06-11	+7 (999) 999-99-99	T	O		
10	15	-5000	2021-06-21	2021-06-21	+7 (222) 222-22-22	T	O		

6. Уменьшить стоимость договора пользователям из Москвы на 50 рублей

До:

```
1 select * from contract
```

	id_contract [PK] integer	id_tariff integer	start_date date	end_date date	price real	phone_number character varying (20)
1		3	1	2019-09-09	2029-09-09	900 +7 (999) 999-99-95
2		5	3	2021-06-20	2025-06-20	5000 +7 (222) 222-22-22
3		6	3	2011-01-01	2021-01-01	5000 +7 (333) 333-33-33
4		7	2	2021-06-20	2025-06-20	200 +7 (444) 444-44-44
5		1	1	2020-01-01	2030-01-01	1000 +7 (111) 111-11-11
6		2	2	2018-03-10	2030-01-01	150 +7 (123) 456-78-90
7		4	3	2021-01-01	2030-01-01	5000 +7 (999) 999-99-99
8		8	1	2021-06-20	2030-01-01	1000 +7 (555) 555-55-55

После:

```
1 update contract
2 set price = price - 50
3 where id_contract in
4 (
5     select id_contract
6     from contract natural join client
7     where city like 'Moscow'
8 );
9
10 select * from contract;
```

	id_contract [PK] integer	id_tariff integer	start_date date	end_date date	price real	phone_number character varying (20)
1		5	3	2021-06-20	2025-06-20	5000 +7 (222) 222-22-22
2		6	3	2011-01-01	2021-01-01	5000 +7 (333) 333-33-33
3		7	2	2021-06-20	2025-06-20	200 +7 (444) 444-44-44
4		2	2	2018-03-10	2030-01-01	150 +7 (123) 456-78-90
5		4	3	2021-01-01	2030-01-01	5000 +7 (999) 999-99-99
6		8	1	2021-06-20	2030-01-01	1000 +7 (555) 555-55-55
7		1	1	2020-01-01	2030-01-01	950 +7 (111) 111-11-11
8		3	1	2019-09-09	2029-09-09	850 +7 (999) 999-99-95

7. Удалить пользователей без договора

До:

```
1 select * from client
```

	phone_number	full_name	city	address	balance
	[PK] character varying (20)	character varying (100)	character varying (50)	character varying (200)	real
1	+7 (999) 999-99-99	Ivanov Ivan	Ivanovo	ulitsa Ivanovskaya	1000
2	+7 (999) 999-99-95	Sidorov Petr	Moscow	Lenina st.	0
3	+7 (222) 222-22-22	Napoleon	Paris	Louvre	100000
4	+7 (333) 333-33-33	Elizabeth II	London	Buckingham Palace	200000
5	+7 (444) 444-44-44	Sherlock Holmes	London	Baker Street	-300
6	+7 (555) 555-55-55	Litvak Igor	St. Petersburg	Kronverksky prospekt	0
7	+7 (111) 111-11-11	Pertova Masha	Moscow	Gagarina st.	0
8	+7 (123) 456-78-90	Smirnov Vasya	St. Petersburg	Nevsky prospekt	400
9	+7 (123) 123-12-12	Dimasov Dima	Moscow	Sadovoye Koltso	0

После:

```
1 delete from client
2 where phone_number not in
3 (
4     select phone_number from contract
5 );
6
7 select * from client;
```

	phone_number	full_name	city	address	balance
	[PK] character varying (20)	character varying (100)	character varying (50)	character varying (200)	real
1	+7 (999) 999-99-99	Ivanov Ivan	Ivanovo	ulitsa Ivanovskaya	1000
2	+7 (999) 999-99-95	Sidorov Petr	Moscow	Lenina st.	0
3	+7 (222) 222-22-22	Napoleon	Paris	Louvre	100000
4	+7 (333) 333-33-33	Elizabeth II	London	Buckingham Palace	200000
5	+7 (444) 444-44-44	Sherlock Holmes	London	Baker Street	-300
6	+7 (555) 555-55-55	Litvak Igor	St. Petersburg	Kronverksky prospekt	0
7	+7 (111) 111-11-11	Pertova Masha	Moscow	Gagarina st.	0
8	+7 (123) 456-78-90	Smirnov Vasya	St. Petersburg	Nevsky prospekt	400

Вывод: В ходе выполнения лабораторной работы я овладел навыками использования запросов и подзапросов для выборки и модификации данных в СУБД pgAdmin 4.