Рубежный контроль №1

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1) Текстовое описание набора данных

В качестве набора данных мы будем использовать набор данных - https://www.kaggle.com/rubenssjr/brasilian-houses-to-rent (https://www.kaggle.com/rubenssjr/brasilian-houses-to-rent)
Columns
id
cityCidade onde o imóvel está localizada / City where the property is located
areaArea do imovel / Property area
roomsNumero de quartos/ Quantity of rooms
bathroomNumero de banheiros / Quantity of bathroom
parking spacesNumero de vagas / Quantity of parking spaces
floorAndar / Floor
animalAceita animais? / Acept animals?
furnitureMobilhada? / Furniture?
hoaValor do condominio / Homeowners association tax
rent amountValor do Aluguel / Rent amount
property taxIPTU / Property tax
fire insuranceSeguro Incendio / Fire Insurance
totalValor total / Total

In [2]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
sns.set(style="ticks", rc={'figure.figsize': (10,10)})
```

In [3]:

```
data = pd.read_csv(r"C:\Users\VTsapiy\Downloads\MMO\houses_to_rent_v2.csv")
```

In [4]:

```
data.head()
```

Out[4]:

	city	area	rooms	bathroom	parking spaces	floor	animal	furniture	hoa (R$)	rent amount (R$)	property tax (R$)	ir
0	São Paulo	70	2	1	1	7	acept	furnished	2065	3300	211	
1	São Paulo	320	4	4	0	20	acept	not furnished	1200	4960	1750	
2	Porto Alegre	80	1	1	1	6	acept	not furnished	1000	2800	0	
3	Porto Alegre	51	2	1	0	2	acept	not furnished	270	1112	22	
4	São Paulo	25	1	1	0	1	not acept	not furnished	0	800	25	

2) Основные характеристики датасета

In [5]:

```
data.shape
```

Out[5]:

```
(10692, 13)
```

In [6]:

```
total_count = data.shape[0]
print("Всего строк {}".format(total_count))
```

```
Всего строк 10692
```

In [7]:

```
data.columns
```

Out[7]:

```
Index(['city', 'area', 'rooms', 'bathroom', 'parking spaces', 'floor',
       'animal', 'furniture', 'hoa (R$)', 'rent amount (R$)',
       'property tax (R$)', 'fire insurance (R$)', 'total (R$)'],
      dtype='object')
```

In [8]:

```
data.dtypes
```

Out[8]:

```
city                  object
area                   int64
rooms                  int64
bathroom               int64
parking spaces         int64
floor                 object
animal                object
furniture             object
hoa (R$)               int64
rent amount (R$)       int64
property tax (R$)      int64
fire insurance (R$)    int64
total (R$)             int64
dtype: object
```

In [9]:

```
for col in data.columns:
    temp_null_count = data[data[col].isnull()].shape[0]
    print('{} - {}'.format(col, temp_null_count))
```

```
city - 0
area - 0
rooms - 0
bathroom - 0
parking spaces - 0
floor - 0
animal - 0
furniture - 0
hoa (R$) - 0
rent amount (R$) - 0
property tax (R$) - 0
fire insurance (R$) - 0
total (R$) - 0
```

Строк соедржащие null не обнаружено

In [10]:

```
big_area = data.drop(data.loc[data['area'] > 10000].index)
big_area = big_area.drop(big_area.loc[big_area['rent amount (R$)'] > 21000].index)
# Удалим площадь недвижимости более 10000 и стоимость аренды блоее 21000, для удобства и кр
```

In [11]:

```
big_area1 = data.drop(data.loc[data['area'] > 1250].index)
big_area1 = big_area.drop(big_area.loc[big_area['rent amount (R$)'] > 16000].index)
```

3) Визуальное исследование датасета

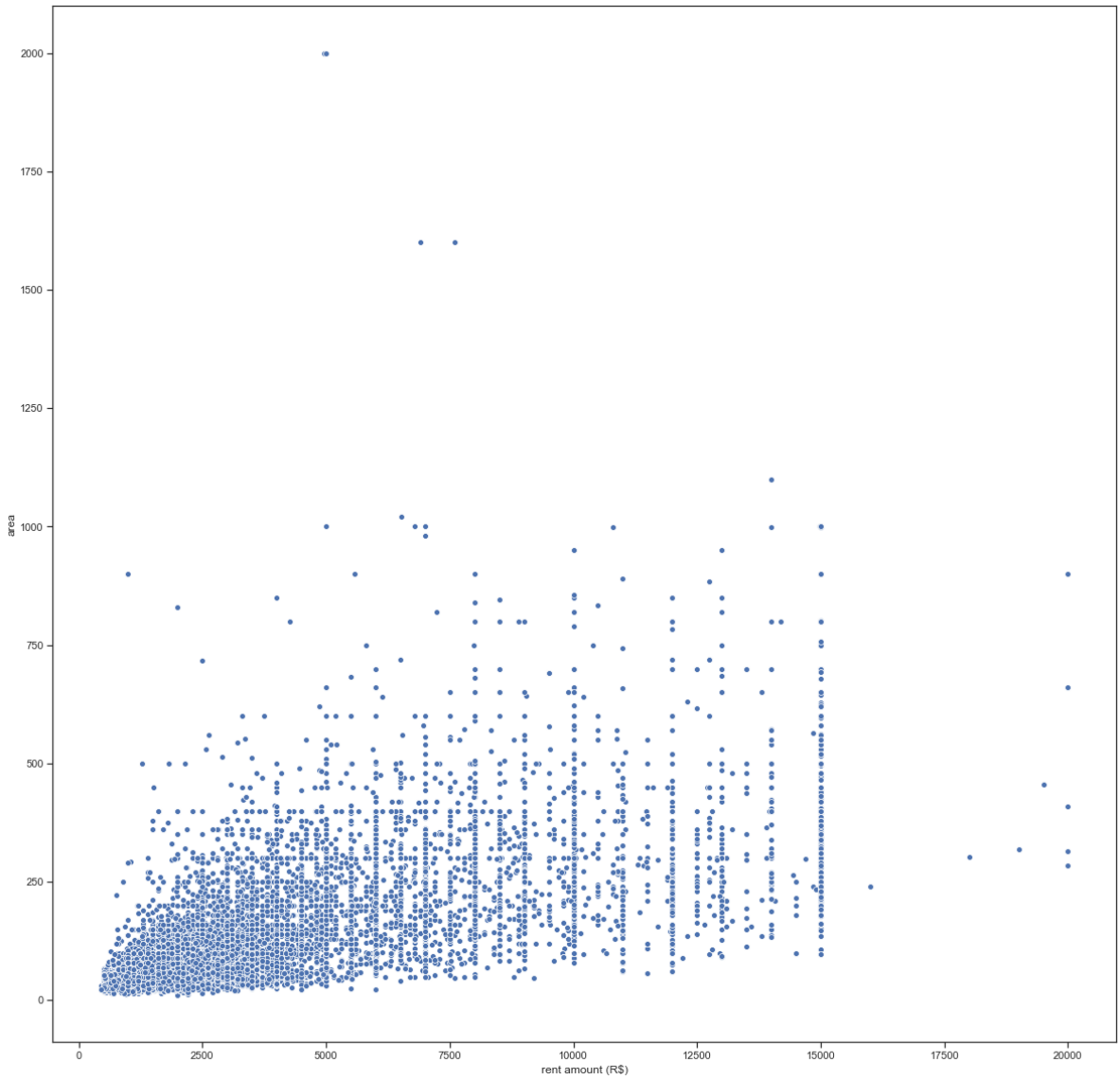
Диаграмма рассеяния

In [12]:

```
fig, ax = plt.subplots(figsize=(20,20))
sns.scatterplot(ax=ax, x='rent amount (R$)', y='area', data=big_area)
```

Out[12]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x585bb10>
```

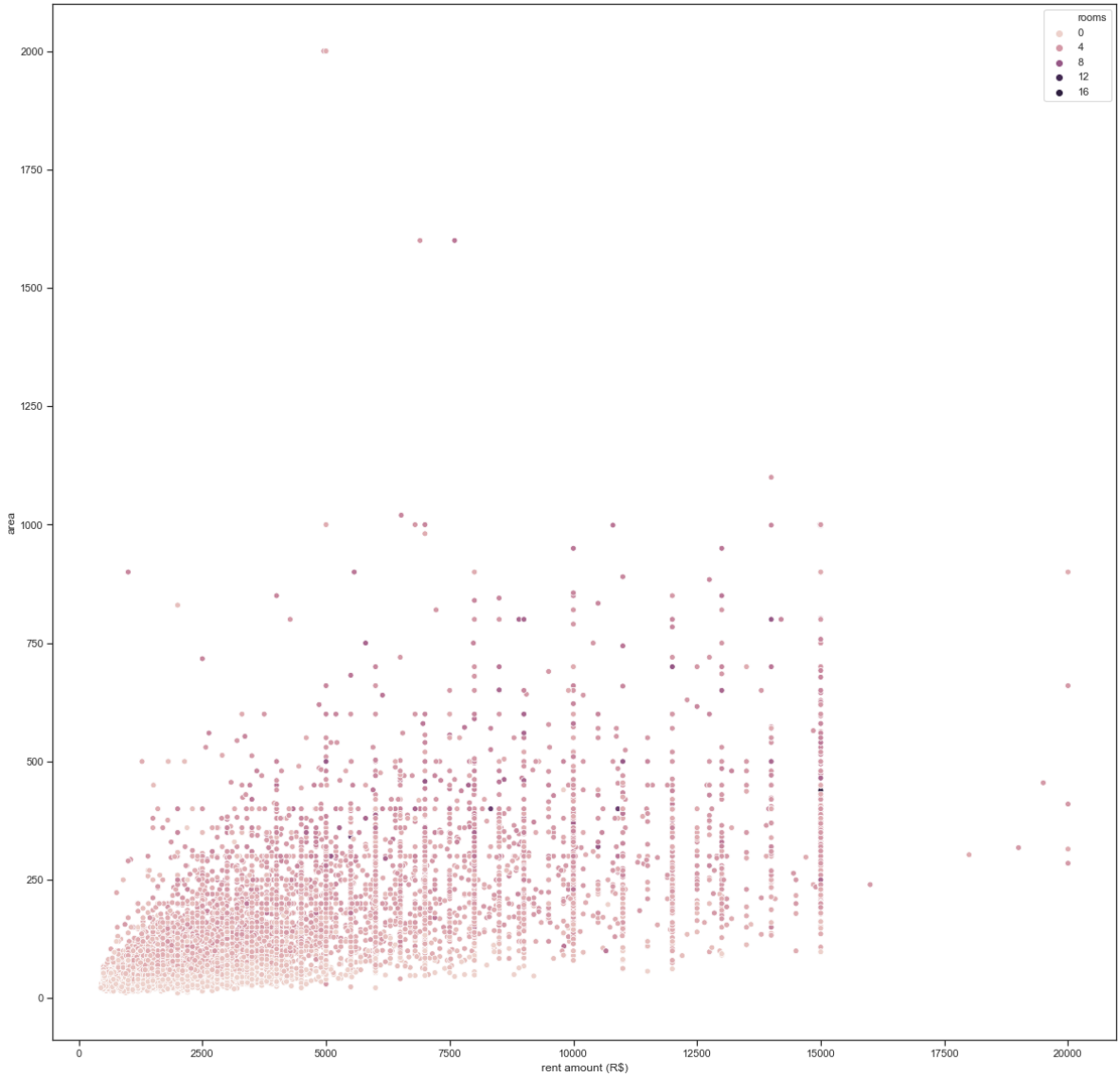


In [13]:

```
fig, ax = plt.subplots(figsize=(20,20))
sns.scatterplot(ax=ax, x='rent amount (R$)', y='area', data=big_area, hue='rooms')
```

Out[13]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xe7b4f70>
```

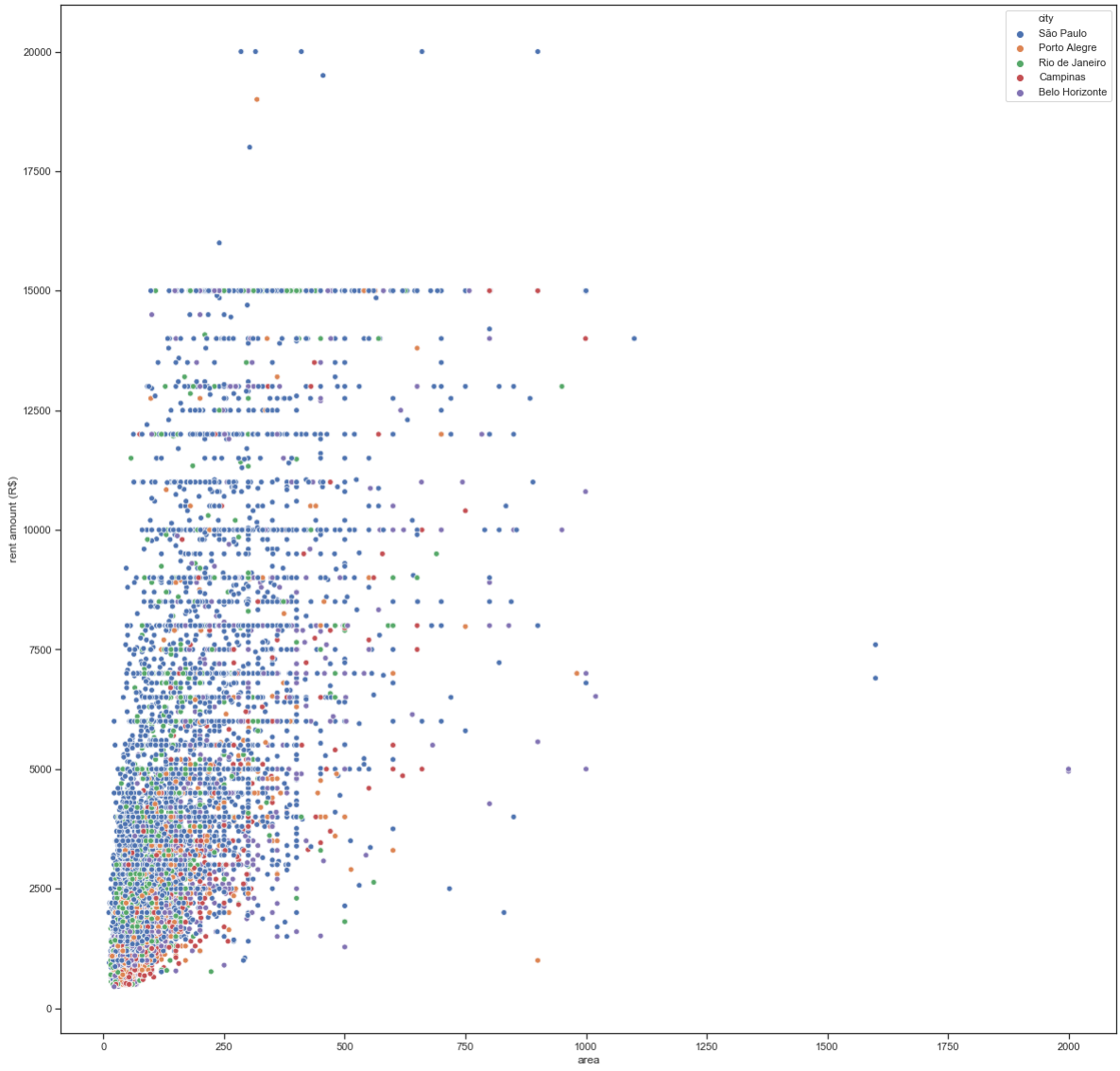


In [14]:

```
fig, ax = plt.subplots(figsize=(20,20))
sns.scatterplot(ax=ax, x='area', y='rent amount (R$)', data=big_area, hue='city')
# Сегментация по городам
```

Out[14]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x10156730>
```

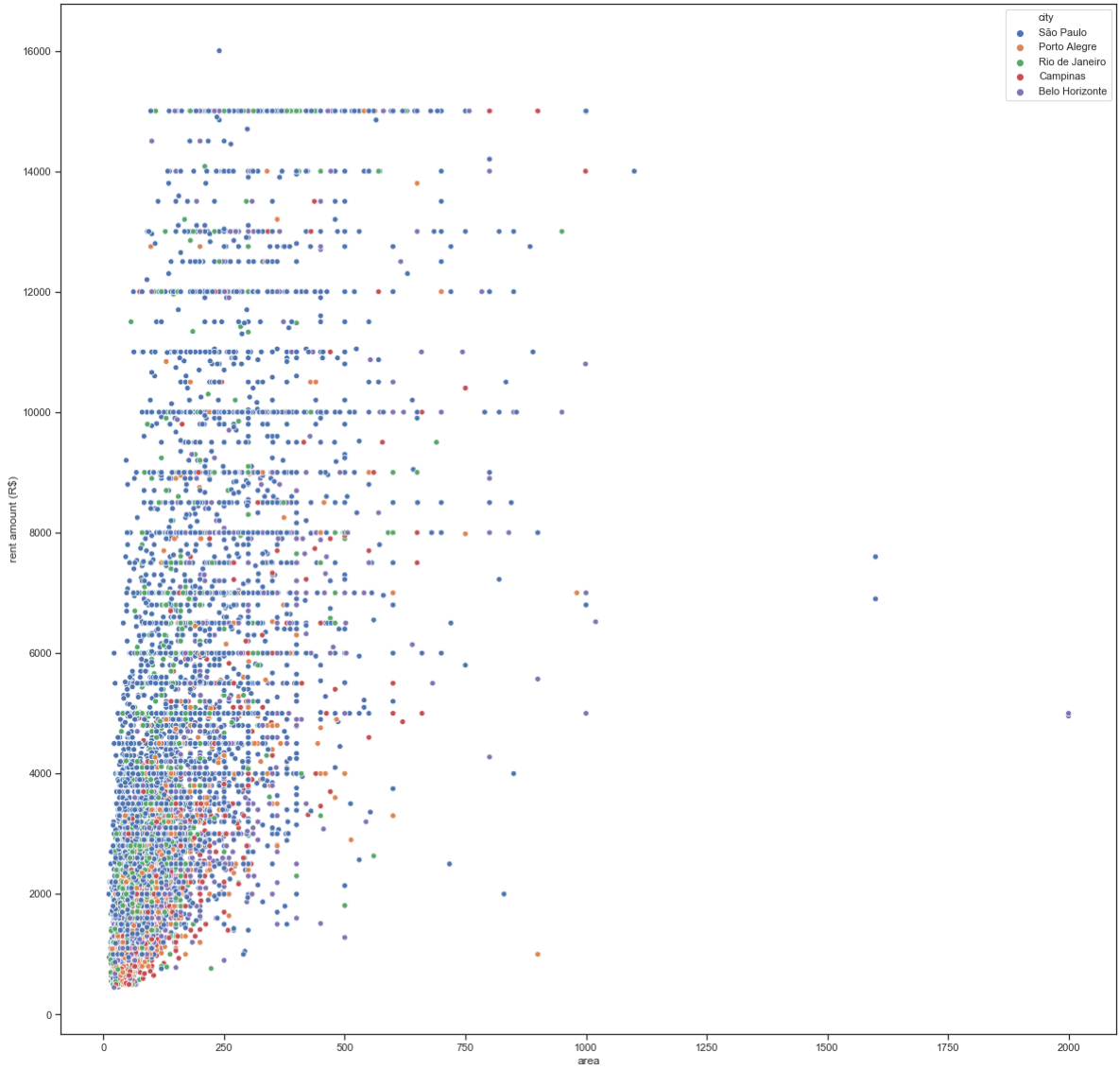


In [15]:

```
fig, ax = plt.subplots(figsize=(20,20))
sns.scatterplot(ax=ax, x='area', y='rent amount (R$)', data=big_area1, hue='city')
```

Out[15]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x10166410>
```



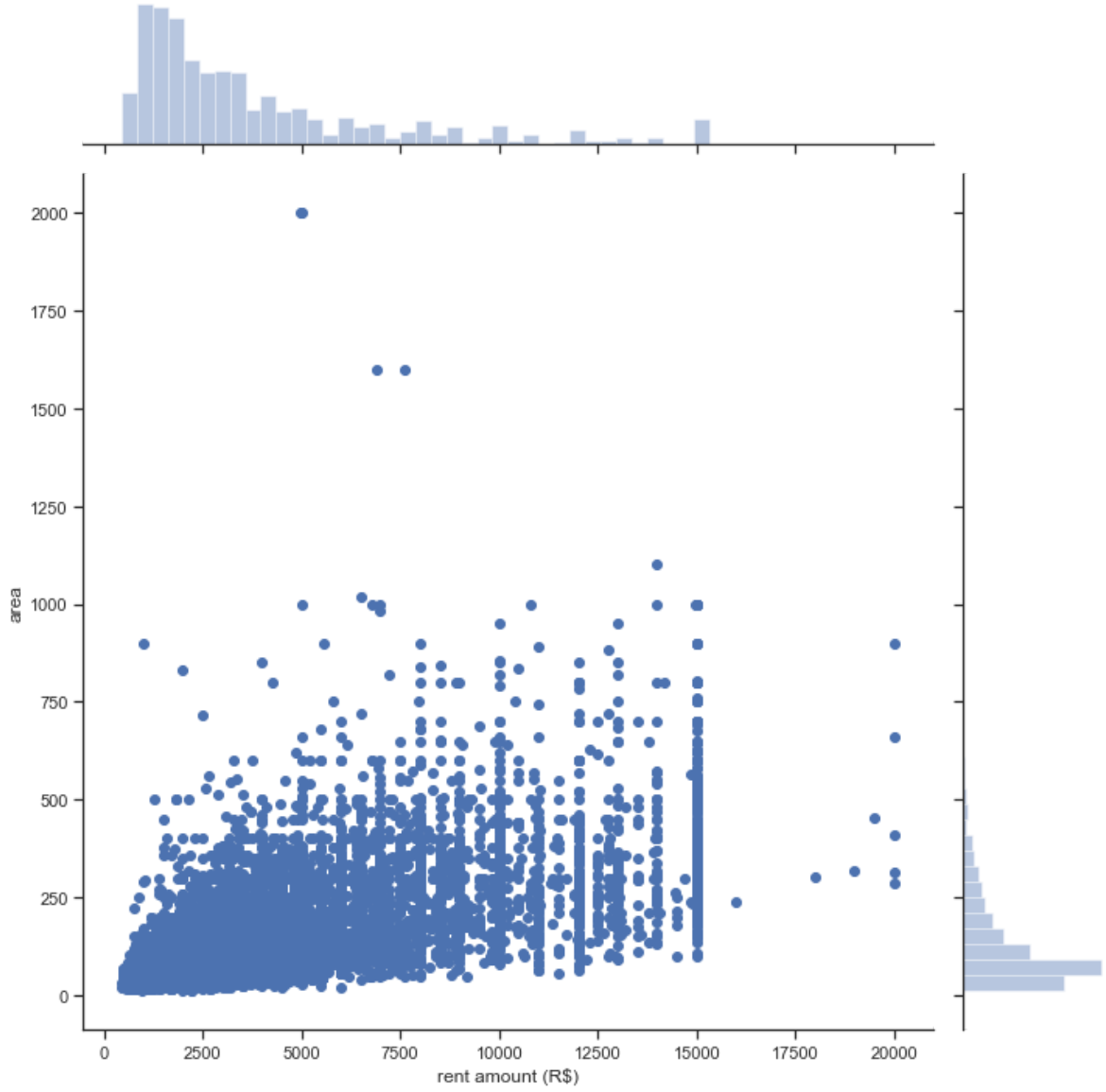
Гистограмма

In [17]:

```
sns.jointplot(x='rent amount (R$)', y='area', data=big_area, height=10)
```

Out[17]:

```
<seaborn.axisgrid.JointGrid at 0x1075e1d0>
```

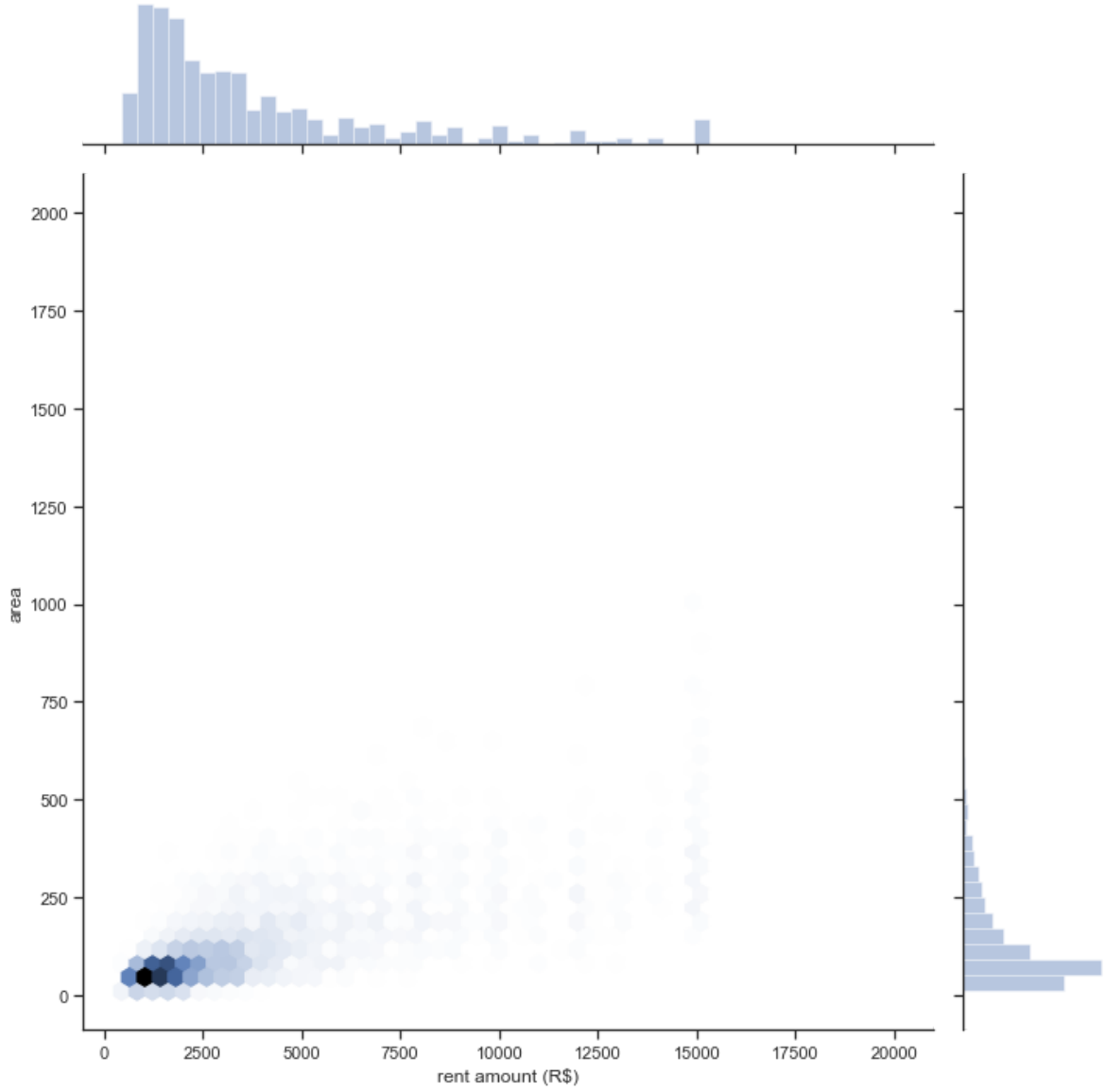


In [86]:

```
sns.jointplot(x='rent amount (R$)', y='area', data=big_area, kind="hex", height=10)
```

Out[86]:

```
<seaborn.axisgrid.JointGrid at 0x1508db90>
```

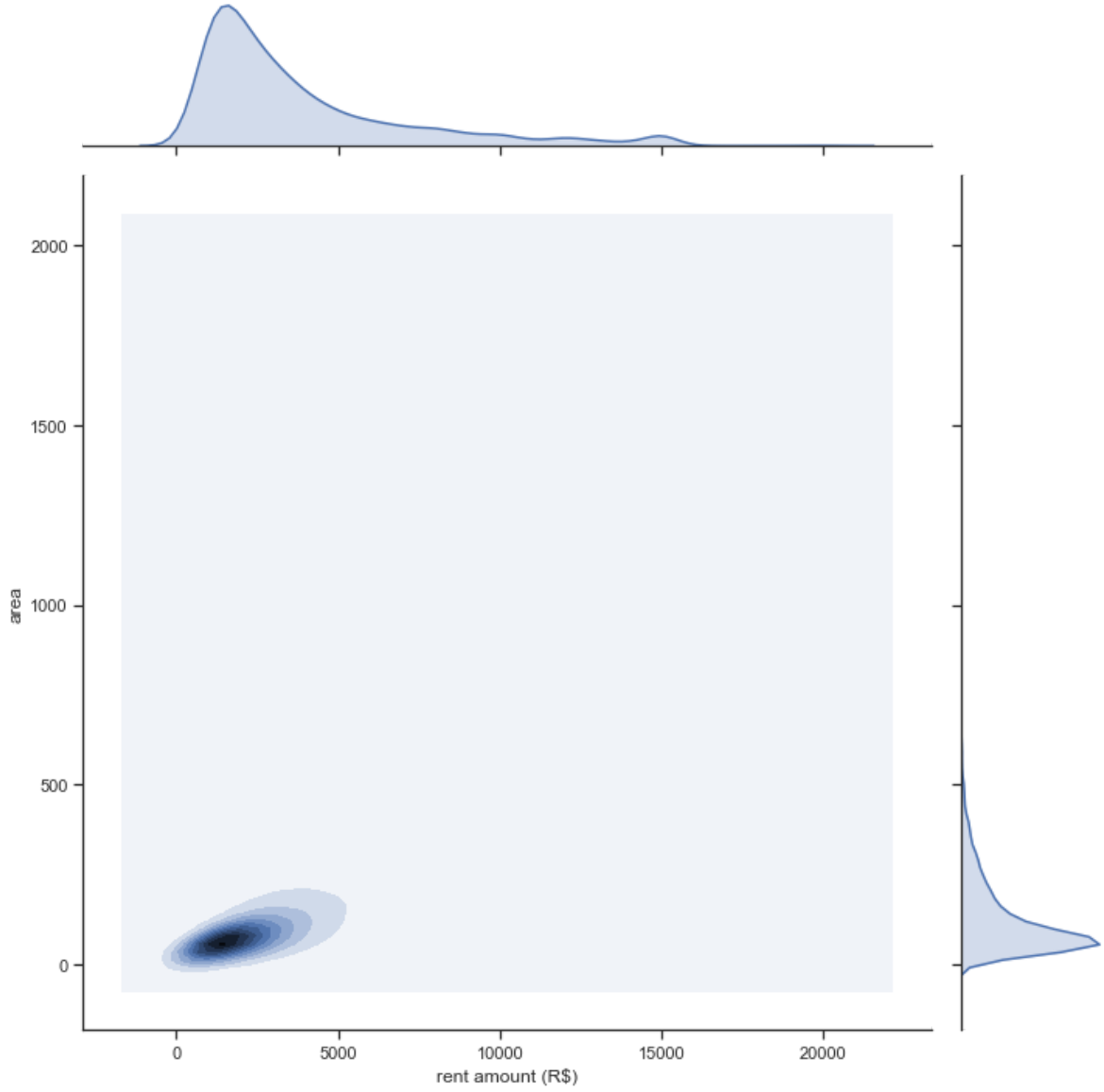


In [90]:

```
sns.jointplot(x='rent amount (R$)', y='area', data=big_area, kind="kde", height=10)
```

Out[90]:

```
<seaborn.axisgrid.JointGrid at 0x15db4fd0>
```



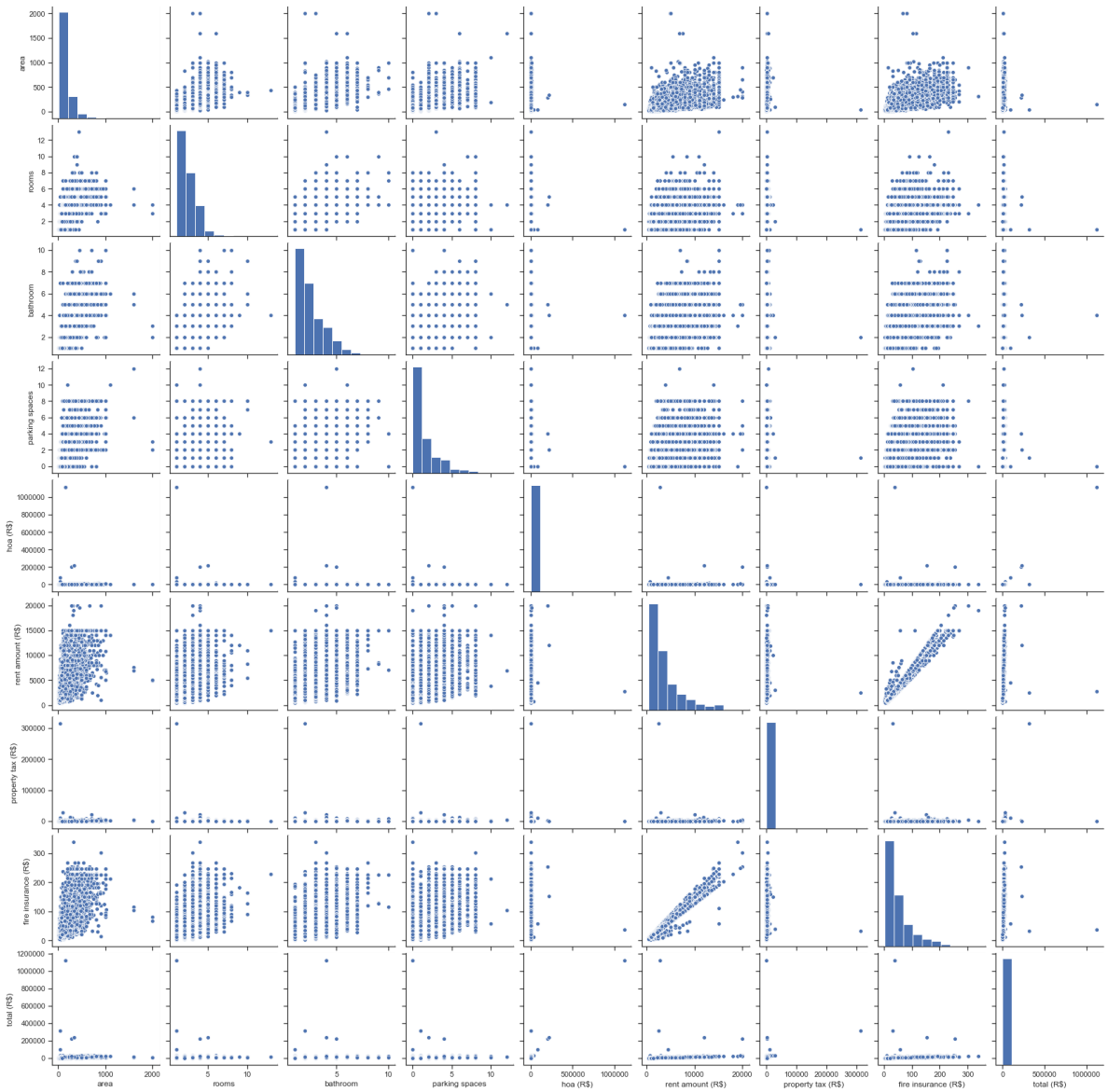
Парные Диаграммы

In [91]:

```
sns.pairplot(big_area)
```

Out[91]:

```
<seaborn.axisgrid.PairGrid at 0x16252630>
```



In [ ]:

```
sns.pairplot(big_area, hue="city")
```

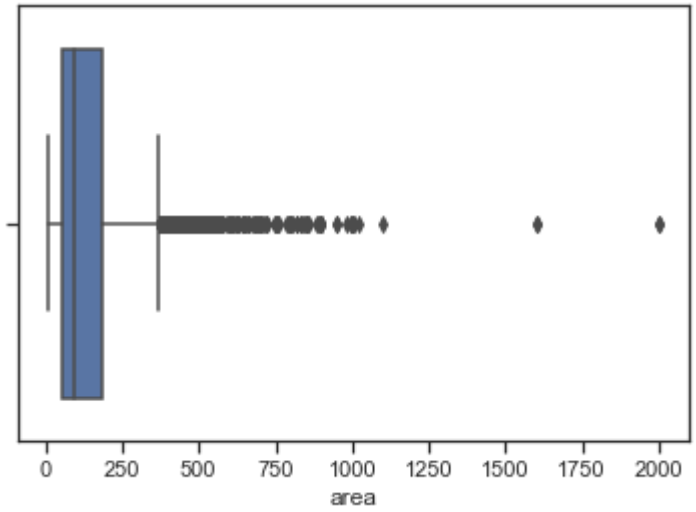
Ящик с усами

In [17]:

```
sns.boxplot(x=big_area['area'])
```

Out[17]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x1022adf0>
```

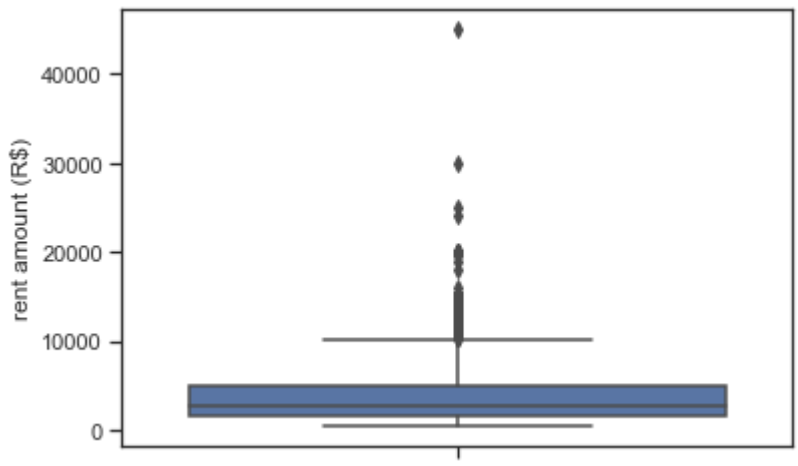


In [20]:

```
sns.boxplot(y=data['rent amount (R$)'])
```

Out[20]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xd50e10>
```

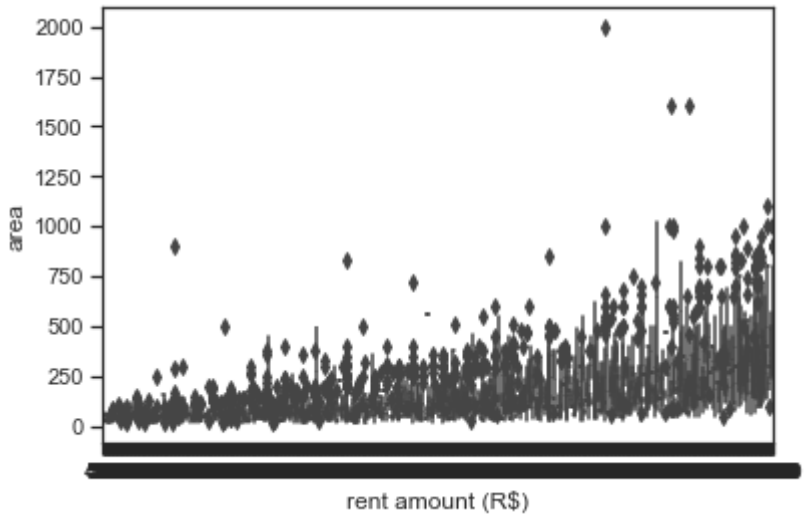


In [24]:

```
sns.boxplot(x='rent amount (R$)', y='area', data=big_area1)
```

Out[24]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x198d2730>
```



Какие графики Вы построили и почему? Я построил диаграммы рассивания на основании двух параметров, площади и стоимости аренды. Предварительно исклчил из основной выборки недвижимость с максимальными значениями для исследования основной массы, а не еденичных едениц недвижимости. На диаграммах видно как относится ценовая категория с площадью недвижимости. Так же я построил диаграмму рассеивания, с дополнительным параметром, отображением комнат. На диаграмме видно как кол-во комнат влияет на цену аренды.

Какие выводы о наборе данных Вы можете сделать на основании построенных графиков? На основании графикомd можно сказать, что самые большие участки находятся в San Paolo. Наиболее дешевая и небольшая по площади недвижимость находится в Porto Alegre и Campinas.

Корреляционный анализ

In [23]:

```
data.corr()
```

Out[23]:

	area	rooms	bathroom	parking spaces	hoa (R$)	rent amount (R$)	property tax (R$)	fire insurance (R$)	
area	1.000000	0.193796	0.226766	0.193983	0.006890	0.180742	0.039059	0.188078	0
rooms	0.193796	1.000000	0.733763	0.617510	0.007139	0.541758	0.075252	0.565148	0
bathroom	0.226766	0.733763	1.000000	0.697379	0.050271	0.668504	0.109253	0.676399	0
parking spaces	0.193983	0.617510	0.697379	1.000000	0.009321	0.578361	0.098378	0.597348	0
hoa (R$)	0.006890	0.007139	0.050271	0.009321	1.000000	0.036490	0.007627	0.029535	0
rent amount (R$)	0.180742	0.541758	0.668504	0.578361	0.036490	1.000000	0.107884	0.987343	0
property tax (R$)	0.039059	0.075252	0.109253	0.098378	0.007627	0.107884	1.000000	0.105661	0
fire insurance (R$)	0.188078	0.565148	0.676399	0.597348	0.029535	0.987343	0.105661	1.000000	0
total (R$)	0.051799	0.134597	0.208339	0.148684	0.955024	0.264490	0.218344	0.254911	1

In [26]:

```
data.corr(method='pearson')
# Метод Пирсона
```

Out[26]:

	area	rooms	bathroom	parking spaces	hoa (R$)	rent amount (R$)	property tax (R$)	fire insurance (R$)	
area	1.000000	0.193796	0.226766	0.193983	0.006890	0.180742	0.039059	0.188078	0
rooms	0.193796	1.000000	0.733763	0.617510	0.007139	0.541758	0.075252	0.565148	0
bathroom	0.226766	0.733763	1.000000	0.697379	0.050271	0.668504	0.109253	0.676399	0
parking spaces	0.193983	0.617510	0.697379	1.000000	0.009321	0.578361	0.098378	0.597348	0
hoa (R$)	0.006890	0.007139	0.050271	0.009321	1.000000	0.036490	0.007627	0.029535	0
rent amount (R$)	0.180742	0.541758	0.668504	0.578361	0.036490	1.000000	0.107884	0.987343	0
property tax (R$)	0.039059	0.075252	0.109253	0.098378	0.007627	0.107884	1.000000	0.105661	0
fire insurance (R$)	0.188078	0.565148	0.676399	0.597348	0.029535	0.987343	0.105661	1.000000	0
total (R$)	0.051799	0.134597	0.208339	0.148684	0.955024	0.264490	0.218344	0.254911	1

In [27]:

```
data.corr(method='kendall')
# Метод Кендала
```

Out[27]:

	area	rooms	bathroom	parking spaces	hoa (R$)	rent amount (R$)	property tax (R$)	fire insurance (R$)	
area	1.000000	0.715436	0.686648	0.568822	0.210480	0.532851	0.510757	0.551117	0
rooms	0.715436	1.000000	0.682927	0.562424	0.177163	0.465190	0.468680	0.477098	0
bathroom	0.686648	0.682927	1.000000	0.619127	0.252538	0.569937	0.530415	0.576193	0
parking spaces	0.568822	0.562424	0.619127	1.000000	0.205077	0.482536	0.463745	0.487772	0
hoa (R$)	0.210480	0.177163	0.252538	0.205077	1.000000	0.283055	0.316656	0.239823	0
rent amount (R$)	0.532851	0.465190	0.569937	0.482536	0.283055	1.000000	0.490645	0.937742	0
property tax (R$)	0.510757	0.468680	0.530415	0.463745	0.316656	0.490645	1.000000	0.487577	0
fire insurance (R$)	0.551117	0.477098	0.576193	0.487772	0.239823	0.937742	0.487577	1.000000	0
total (R$)	0.544737	0.481159	0.590431	0.500842	0.426224	0.856535	0.560713	0.807292	1

In [28]:

```
data.corr(method='spearman')
# Метод Спермана
```

Out[28]:

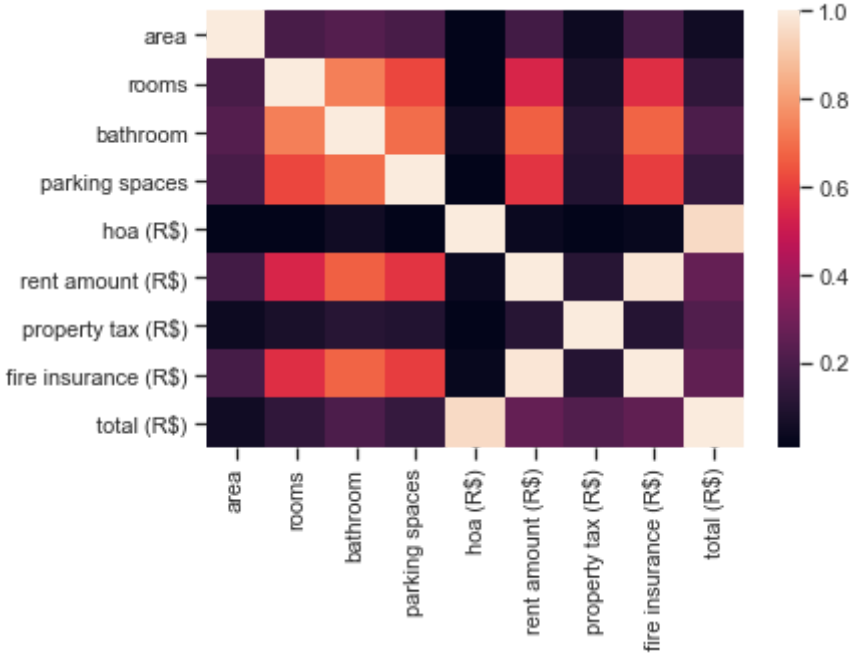
	area	rooms	bathroom	parking spaces	hoa (R$)	rent amount (R$)	property tax (R$)	fire insurance (R$)	
area	1.000000	0.848880	0.827743	0.701161	0.225983	0.728095	0.682270	0.745816	0
rooms	0.848880	1.000000	0.769822	0.646679	0.206182	0.600969	0.595516	0.613788	0
bathroom	0.827743	0.769822	1.000000	0.702826	0.293821	0.715890	0.654556	0.721150	0
parking spaces	0.701161	0.646679	0.702826	1.000000	0.229139	0.620175	0.582921	0.625150	0
hoa (R$)	0.225983	0.206182	0.293821	0.229139	1.000000	0.355785	0.392537	0.293228	0
rent amount (R$)	0.728095	0.600969	0.715890	0.620175	0.355785	1.000000	0.659230	0.988045	0
property tax (R$)	0.682270	0.595516	0.654556	0.582921	0.392537	0.659230	1.000000	0.656049	0
fire insurance (R$)	0.745816	0.613788	0.721150	0.625150	0.293228	0.988045	0.656049	1.000000	0
total (R$)	0.742642	0.621837	0.740281	0.641078	0.519755	0.968176	0.731439	0.945772	1

In [29]:

```
sns.heatmap(data.corr())
```

Out[29]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x3027c70>
```

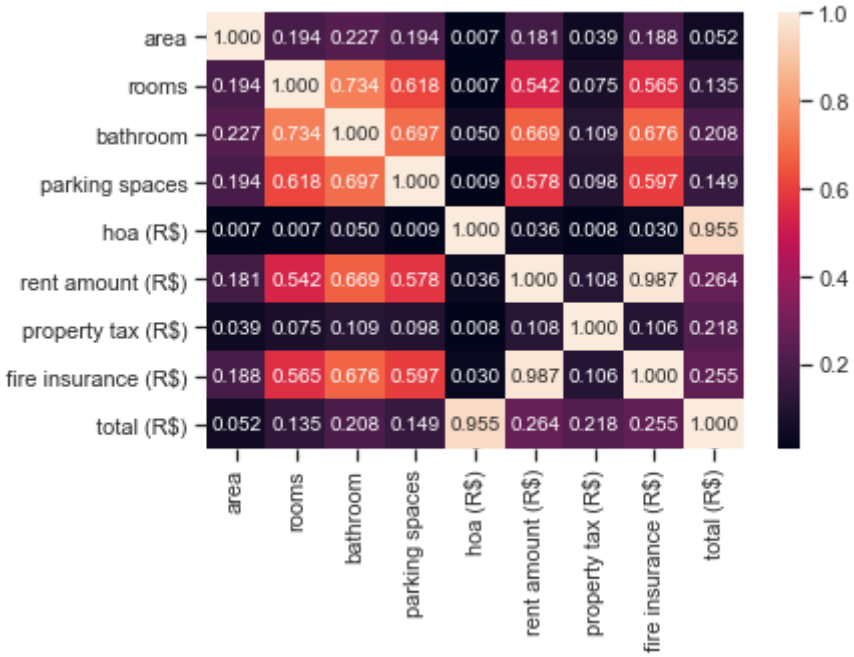


In [30]:

```
sns.heatmap(data.corr(), annot=True, fmt='.3f')
```

Out[30]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x214562f0>
```

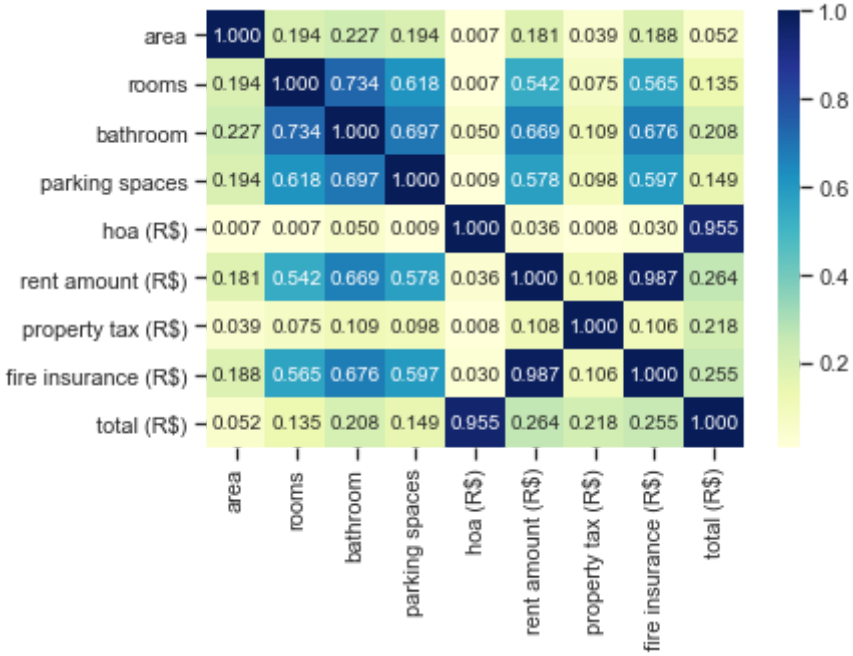


In [31]:

```
sns.heatmap(data.corr(), annot=True, fmt='.3f', cmap='YlGnBu')
```

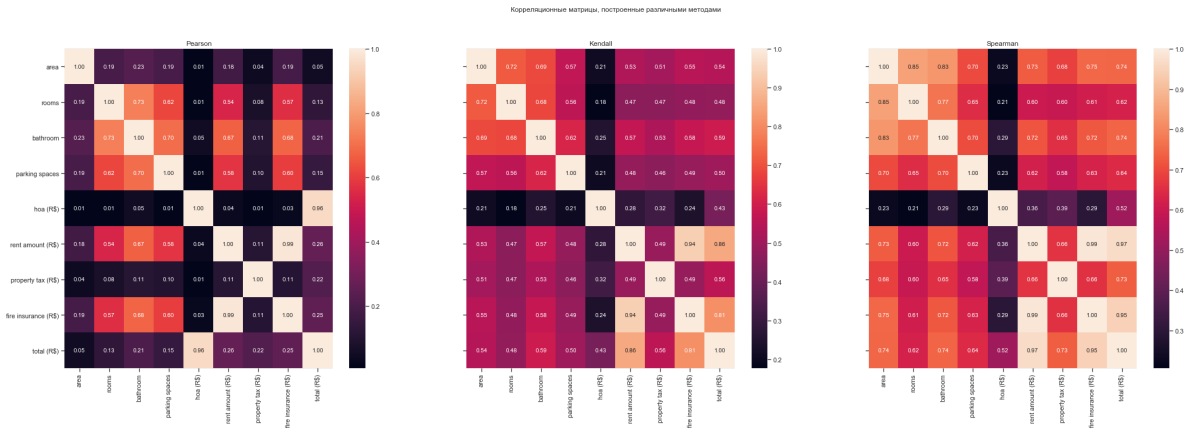
Out[31]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x211ff870>
```



In [32]:

```
fig, ax = plt.subplots(1, 3, sharex='col', sharey='row', figsize=(35,10))
sns.heatmap(data.corr(method='pearson'), ax=ax[0], annot=True, fmt='.2f')
sns.heatmap(data.corr(method='kendall'), ax=ax[1], annot=True, fmt='.2f')
sns.heatmap(data.corr(method='spearman'), ax=ax[2], annot=True, fmt='.2f')
fig.suptitle('Корреляционные матрицы, построенные различными методами')
ax[0].title.set_text('Pearson')
ax[1].title.set_text('Kendall')
ax[2].title.set_text('Spearman')
```



Из диаграмм видно наиболее коррелирующие значения.