

Housing

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```
install.packages('QuantPsyc') install.packages('car')
```

```
## Warning: package 'readxl' was built under R version 4.0.5
```

Explain any transformations or modifications you made to the dataset

```
## Warning: package 'dplyr' was built under R version 4.0.5
```

```
##
```

```
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
```

```
##
```

```
## filter, lag
```

```
## The following objects are masked from 'package:base':
```

```
##
```

```
## intersect, setdiff, setequal, union
```

Create two variables; one that will contain the variables Sale Price and Square Foot of Lot (same variables used from previous assignment on simple regression) and one that will contain Sale Price and several additional predictors of your choice. Explain the basis for your additional predictor selections.

- The other predictors i used were number of bedrooms/bathrooms i belive the more bedrooms/bathrooms a house has the more expensive it will be

Execute a summary() function on two variables defined in the previous step to compare the model results. What are the R2 and Adjusted R2 statistics? Explain what these results tell you about the overall model. Did the inclusion of the additional predictors help explain any large variations found in Sale Price?

```
##
```

```
## Call:
```

```
## lm(formula = `Sale Price` ~ sq_ft_lot, data = housing_data_row_id)
```

```
##
```

```
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
```

```
## -2016064 -194842  -63293   91565  3735109
```

```
##
```

```
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept) 6.418e+05  3.800e+03  168.90  <2e-16 ***
```

```
## sq_ft_lot    8.510e-01  6.217e-02   13.69  <2e-16 ***
```

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 401500 on 12863 degrees of freedom
## Multiple R-squared:  0.01435, Adjusted R-squared:  0.01428
## F-statistic: 187.3 on 1 and 12863 DF, p-value: < 2.2e-16

##
## Call:
## lm(formula = `Sale Price` ~ +bedrooms + bath_full_count + bath_half_count,
##     data = housing_data_row_id)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -3361545 -158497  -54210   65900  3924964
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    140053     14842   9.436  <2e-16 ***
## bedrooms        65936      4051  16.276  <2e-16 ***
## bath_full_count 137174      5513  24.882  <2e-16 ***
## bath_half_count  72737      6581  11.053  <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 381400 on 12861 degrees of freedom
## Multiple R-squared:  0.1108, Adjusted R-squared:  0.1106
## F-statistic: 534.1 on 3 and 12861 DF, p-value: < 2.2e-16
```

- first variable R2 : 0.014 and adjusted 0.01428.second variable: 0.0508 and 0.0507
The addition of rooms improved our model

Considering the parameters of the multiple regression model you have created, what are the standardized betas for each parameter and what do the values indicate?

```
## Warning: package 'QuantPsyc' was built under R version 4.0.5
## Loading required package: boot
## Loading required package: MASS
##
## Attaching package: 'MASS'
##
## The following object is masked from 'package:dplyr':
##
##     select
##
## Attaching package: 'QuantPsyc'
```

```
## The following object is masked from 'package:base':
##
##      norm
##
## sq_ft_lot
## 0.1198122
##
##      bedrooms bath_full_count bath_half_count
##      0.14285610      0.22076356      0.09466283
```

- the more full baths a house has the higher the price will be compared to any additional rooms

Calculate the confidence intervals for the parameters in your model and explain what the results indicate.

```
##              2.5 %      97.5 %
## (Intercept) 6.343730e+05 6.492698e+05
## sq_ft_lot   7.291208e-01 9.728641e-01
##
##              2.5 %      97.5 %
## (Intercept)   110960.21 169146.43
## bedrooms      57995.34  73876.61
## bath_full_count 126367.92 147980.82
## bath_half_count 59837.77  85636.60
```

- These confidence intervals suggest that our data is representative of our population

Assess the improvement of the new model compared to your original model (simple regression model) by testing whether this change is significant by performing an analysis of variance.

```
## Analysis of Variance Table
##
## Model 1: `Sale Price` ~ sq_ft_lot
## Model 2: `Sale Price` ~ +bedrooms + bath_full_count + bath_half_count
##   Res.Df      RSS Df Sum of Sq    F    Pr(>F)
## 1  12863 2.0734e+15
## 2  12861 1.8705e+15  2 2.0286e+14 697.4 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Perform casewise diagnostics to identify outliers and/or influential cases, storing each function's output in a dataframe assigned to a unique variable name.

##calculate the standardized residuals using the appropriate command, specifying those that are +-2, storing the results of large residuals in a variable you create.

Use the appropriate function to show the sum of large residuals.

```
## [1] 328
```

Which specific variables have large residuals (only cases that evaluate as TRUE)?

Investigate further by calculating the leverage, cooks distance, and covariance ratios. Comment on all cases that are problematic.

##	cooks_distance	leverage	covariance_ratios
## 72	0.0006196532	0.0003517856	0.9984728
## 108	0.0004966530	0.0004794589	0.9995025
## 115	0.0028284793	0.0013253635	0.9989854
## 116	0.0002416428	0.0002322704	0.9992494
## 239	0.0006753128	0.0004177624	0.9987190
## 245	0.0001659994	0.0001649403	0.9992242
## 246	0.0007274215	0.0003902791	0.9983842
## 261	0.0002754727	0.0002430290	0.9991444
## 295	2.1788619593	0.0924027294	1.0731003
## 385	0.0030378097	0.0006280824	0.9949343
## 396	0.0018921940	0.0007529679	0.9979412
## 459	0.0202641635	0.0108461575	1.0089565
## 475	0.0004978638	0.0003417509	0.9988414
## 482	0.0045699035	0.0034372101	1.0021077
## 612	0.0007057296	0.0003517856	0.9981689
## 656	0.0002450932	0.0001377896	0.9982372
## 661	0.0017097900	0.0003517856	0.9946283
## 662	0.0005942018	0.0003517856	0.9985627
## 670	0.0007952357	0.0001377896	0.9932860
## 671	0.0001475272	0.0001377896	0.9991172
## 679	0.0437026765	0.0158850862	1.0130382
## 785	0.0005894144	0.0003517856	0.9985796
## 811	0.0022531626	0.0002430290	0.9890665
## 853	0.0002348858	0.0001649403	0.9987051
## 916	0.0020643189	0.0019745376	1.0009897
## 929	0.0010052914	0.0007886936	0.9995154
## 1033	0.0010689145	0.0006280824	0.9988235
## 1155	0.0063310841	0.0025894867	0.9998690
## 1179	0.0002248079	0.0001377896	0.9984201
## 1442	0.0023318488	0.0015146620	0.9999140
## 1666	0.0001659994	0.0001649403	0.9992242
## 1745	0.0010978302	0.0003517856	0.9967851
## 1870	0.0062622103	0.0010105045	0.9936331
## 1962	0.0015586766	0.0003517856	0.9951606
## 1963	0.0005389420	0.0002830242	0.9982266
## 1964	0.0020258446	0.0007449857	0.9976771
## 1976	0.0036463837	0.0006966879	0.9945110
## 1977	0.0008321141	0.0001377896	0.9929548
## 1978	0.0030777385	0.0005461355	0.9938630
## 1979	0.0008321141	0.0001377896	0.9929548
## 1980	0.0018256097	0.0003517856	0.9942205
## 1981	0.0035605392	0.0008027431	0.9956064
## 1982	0.0022311678	0.0004644287	0.9948107
## 2020	0.0009159923	0.0003417509	0.9973217

## 2021	0.0003411597	0.0002830242	0.9990950
## 2022	0.0013918934	0.0007449857	0.9987338
## 2084	0.0004360738	0.0003417509	0.9990661
## 2099	0.0007149081	0.0003517856	0.9981365
## 2137	0.0007475234	0.0002830242	0.9973115
## 2157	0.0002036378	0.0001377896	0.9986110
## 2168	0.0010391392	0.0010201616	1.0000656
## 2173	0.0007870240	0.0007529679	0.9997647
## 2174	0.0007870240	0.0007529679	0.9997647
## 2243	0.0003718559	0.0001649403	0.9976734
## 2264	0.0006213193	0.0002612439	0.9976160
## 2302	0.0051127930	0.0049768183	1.0040365
## 2360	0.0006097499	0.0002612439	0.9976710
## 2361	0.0058753997	0.0015146620	0.9970100
## 2469	0.0006852284	0.0002612439	0.9973123
## 2684	0.0035014741	0.0006966879	0.9947686
## 2685	0.0017527776	0.0003517856	0.9944770
## 2686	0.0018188278	0.0003363101	0.9939343
## 2687	0.0017527776	0.0003517856	0.9944770
## 2688	0.0008013241	0.0001377896	0.9932313
## 2689	0.0018188278	0.0003363101	0.9939343
## 2690	0.0021386810	0.0004644287	0.9950575
## 2708	0.0014476723	0.0004644287	0.9969024
## 2709	0.0012063437	0.0003517856	0.9964024
## 2710	0.0012063437	0.0003517856	0.9964024
## 2717	0.0017692942	0.0003517856	0.9944188
## 2742	0.0004659281	0.0003517856	0.9990159
## 2852	0.0230755558	0.0017410497	0.9856634
## 3065	0.0021605329	0.0012958107	0.9995357
## 3097	0.0016693456	0.0003517856	0.9947708
## 3102	0.0008597015	0.0003517856	0.9976253
## 3110	0.0012704665	0.0009001326	0.9994570
## 3132	0.0018889000	0.0008027431	0.9981896
## 3168	0.0051361876	0.0003902791	0.9844244
## 3169	0.0053164036	0.0004471831	0.9860455
## 3170	0.0017584934	0.0001649403	0.9872743
## 3171	0.0017584934	0.0001649403	0.9872743
## 3172	0.0017584934	0.0001649403	0.9872743
## 3173	0.0026234643	0.0002322704	0.9865614
## 3174	0.0017584934	0.0001649403	0.9872743
## 3175	0.0026234643	0.0002322704	0.9865614
## 3176	0.0017584934	0.0001649403	0.9872743
## 3177	0.0017584934	0.0001649403	0.9872743
## 3178	0.0026234643	0.0002322704	0.9865614
## 3179	0.0017584934	0.0001649403	0.9872743
## 3180	0.0017584934	0.0001649403	0.9872743
## 3181	0.0017584934	0.0001649403	0.9872743
## 3182	0.0051361876	0.0003902791	0.9844244
## 3183	0.0051361876	0.0003902791	0.9844244
## 3184	0.0051361876	0.0003902791	0.9844244

## 3185	0.0051361876	0.0003902791	0.9844244
## 3186	0.0051361876	0.0003902791	0.9844244
## 3187	0.0051361876	0.0003902791	0.9844244
## 3188	0.0053164036	0.0004471831	0.9860455
## 3189	0.0026234643	0.0002322704	0.9865614
## 3190	0.0017584934	0.0001649403	0.9872743
## 3191	0.0026234643	0.0002322704	0.9865614
## 3192	0.0017584934	0.0001649403	0.9872743
## 3193	0.0017584934	0.0001649403	0.9872743
## 3194	0.0017584934	0.0001649403	0.9872743
## 3195	0.0017584934	0.0001649403	0.9872743
## 3196	0.0017584934	0.0001649403	0.9872743
## 3197	0.0017584934	0.0001649403	0.9872743
## 3198	0.0051361876	0.0003902791	0.9844244
## 3199	0.0051361876	0.0003902791	0.9844244
## 3200	0.0051361876	0.0003902791	0.9844244
## 3201	0.0051361876	0.0003902791	0.9844244
## 3202	0.0051361876	0.0003902791	0.9844244
## 3260	0.0009050663	0.0006966879	0.9993928
## 3424	0.0004558143	0.0003517856	0.9990516
## 3464	0.0025725302	0.0002322704	0.9868314
## 3465	0.0017233603	0.0001649403	0.9875368
## 3466	0.0017233603	0.0001649403	0.9875368
## 3467	0.0017233603	0.0001649403	0.9875368
## 3468	0.0025725302	0.0002322704	0.9868314
## 3469	0.0017233603	0.0001649403	0.9875368
## 3470	0.0017233603	0.0001649403	0.9875368
## 3471	0.0017233603	0.0001649403	0.9875368
## 3472	0.0017233603	0.0001649403	0.9875368
## 3473	0.0017233603	0.0001649403	0.9875368
## 3474	0.0025725302	0.0002322704	0.9868314
## 3475	0.0017233603	0.0001649403	0.9875368
## 3476	0.0032961986	0.0002830242	0.9861794
## 3477	0.0017233603	0.0001649403	0.9875368
## 3478	0.0050437588	0.0003902791	0.9847156
## 3479	0.0050437588	0.0003902791	0.9847156
## 3480	0.0050437588	0.0003902791	0.9847156
## 3481	0.0050437588	0.0003902791	0.9847156
## 3482	0.0050437588	0.0003902791	0.9847156
## 3483	0.0050437588	0.0003902791	0.9847156
## 3484	0.0052157632	0.0004471831	0.9863225
## 3485	0.0017233603	0.0001649403	0.9875368
## 3486	0.0017233603	0.0001649403	0.9875368
## 3487	0.0017233603	0.0001649403	0.9875368
## 3488	0.0017233603	0.0001649403	0.9875368
## 3489	0.0017233603	0.0001649403	0.9875368
## 3490	0.0025725302	0.0002322704	0.9868314
## 3491	0.0037814487	0.0003417509	0.9869541
## 3492	0.0025725302	0.0002322704	0.9868314
## 3493	0.0017233603	0.0001649403	0.9875368

## 3494	0.0025725302	0.0002322704	0.9868314
## 3495	0.0050437588	0.0003902791	0.9847156
## 3496	0.0050437588	0.0003902791	0.9847156
## 3497	0.0050437588	0.0003902791	0.9847156
## 3523	0.0007481724	0.0003517856	0.9980190
## 4055	0.0011297151	0.0003417509	0.9965456
## 4056	0.0035205287	0.0007449857	0.9951889
## 4411	0.0001708144	0.0001377896	0.9989071
## 4648	0.0039142955	0.0001649403	0.9712684
## 4649	0.0069214632	0.0002612439	0.9680067
## 4695	0.0024005188	0.0003902791	0.9930692
## 4696	0.0012063437	0.0003517856	0.9964024
## 4713	0.0007160382	0.0006280824	0.9995218
## 4740	0.0002790252	0.0002322704	0.9990494
## 4750	0.0039133423	0.0019745376	0.9998260
## 4754	0.0004137973	0.0003517856	0.9992001
## 4821	0.0015148756	0.0007449857	0.9985287
## 4834	0.0011741511	0.0007449857	0.9990969
## 4840	0.0066108679	0.0025894867	0.9997348
## 4934	0.0005074238	0.0002430290	0.9979584
## 4935	0.0003699349	0.0003417509	0.9993066
## 4971	0.0006515745	0.0006280824	0.9996494
## 5083	0.0019782814	0.0012671991	0.9996389
## 5195	0.0021861368	0.0015146620	1.0000336
## 5227	0.0015683010	0.0015146620	1.0005406
## 5491	0.0001512900	0.0001377896	0.9990832
## 5494	0.0001512900	0.0001377896	0.9990832
## 5495	0.0003176949	0.0002430290	0.9989284
## 5496	0.0001512900	0.0001377896	0.9990832
## 5498	0.0001512900	0.0001377896	0.9990832
## 5559	0.0010715393	0.0007529679	0.9992950
## 5924	0.0014031055	0.0012846671	1.0002393
## 6230	0.0010790112	0.0001377896	0.9907393
## 6231	0.0010790112	0.0001377896	0.9907393
## 6232	0.0024130603	0.0003517856	0.9921540
## 6233	0.0020354944	0.0002430290	0.9901719
## 6234	0.0037811287	0.0004794589	0.9910128
## 6235	0.0037811287	0.0004794589	0.9910128
## 6236	0.0037811287	0.0004794589	0.9910128
## 6237	0.0037811287	0.0004794589	0.9910128
## 6238	0.0020354944	0.0002430290	0.9901719
## 6239	0.0010790112	0.0001377896	0.9907393
## 6429	0.0031211969	0.0001377896	0.9725560
## 6430	0.0031211969	0.0001377896	0.9725560
## 6431	0.0031211969	0.0001377896	0.9725560
## 6432	0.0057291269	0.0002430290	0.9715386
## 6433	0.0073467179	0.0003363101	0.9737380
## 6434	0.0073467179	0.0003363101	0.9737380
## 6435	0.0146843886	0.0006966879	0.9750351
## 6436	0.0031211969	0.0001377896	0.9725560

## 6437	0.0031211969	0.0001377896	0.9725560
## 6438	0.0038733998	0.0001649403	0.9715703
## 6439	0.0031211969	0.0001377896	0.9725560
## 6440	0.0119454187	0.0005461355	0.9739145
## 6441	0.0119454187	0.0005461355	0.9739145
## 6442	0.0057291269	0.0002430290	0.9715386
## 6443	0.0081119379	0.0004644287	0.9792160
## 6444	0.0081119379	0.0004644287	0.9792160
## 6445	0.0063999560	0.0003517856	0.9782143
## 6446	0.0063999560	0.0003517856	0.9782143
## 6447	0.0081119379	0.0004644287	0.9792160
## 6448	0.0027215396	0.0001377896	0.9760947
## 6449	0.0063892007	0.0003363101	0.9772141
## 6450	0.0063892007	0.0003363101	0.9772141
## 6451	0.0063999560	0.0003517856	0.9782143
## 6452	0.0063999560	0.0003517856	0.9782143
## 6453	0.0127365434	0.0006966879	0.9784510
## 6454	0.0081119379	0.0004644287	0.9792160
## 6455	0.0127365434	0.0006966879	0.9784510
## 6456	0.0027215396	0.0001377896	0.9760947
## 6457	0.0063892007	0.0003363101	0.9772141
## 6512	0.0015723026	0.0003517856	0.9951126
## 6587	0.0022822078	0.0017139075	1.0003724
## 6739	0.0016847905	0.0011826443	0.9997238
## 6767	0.0007222876	0.0005461355	0.9992128
## 6781	0.0001915234	0.0001377896	0.9987203
## 6852	0.0012817257	0.0009837388	0.9996757
## 6853	0.0012817257	0.0009837388	0.9996757
## 6938	0.0010993760	0.0002430290	0.9949366
## 6939	0.0020715424	0.0005461355	0.9961457
## 6940	0.0005685359	0.0001377896	0.9953240
## 6941	0.0005685359	0.0001377896	0.9953240
## 6942	0.0024138204	0.0006966879	0.9967037
## 6943	0.0037701487	0.0013318742	0.9981271
## 6944	0.0019970770	0.0004794589	0.9956175
## 6945	0.0010993760	0.0002430290	0.9949366
## 6946	0.0005685359	0.0001377896	0.9953240
## 6947	0.0005685359	0.0001377896	0.9953240
## 6948	0.0005685359	0.0001377896	0.9953240
## 7039	0.0006443889	0.0003517856	0.9983855
## 7167	0.0026580466	0.0002430290	0.9870127
## 7210	0.0026672454	0.0005461355	0.9947938
## 7211	0.0031423405	0.0006966879	0.9954073
## 7359	0.0003634351	0.0003417509	0.9993303
## 7446	0.0017413498	0.0001377896	0.9848143
## 7447	0.0017413498	0.0001377896	0.9848143
## 7448	0.0017413498	0.0001377896	0.9848143
## 7449	0.0021872172	0.0001649403	0.9840756
## 7450	0.0021872172	0.0001649403	0.9840756
## 7451	0.0021872172	0.0001649403	0.9840756

## 7452	0.0017413498	0.0001377896	0.9848143
## 7453	0.0017413498	0.0001377896	0.9848143
## 7454	0.0017413498	0.0001377896	0.9848143
## 7455	0.0017413498	0.0001377896	0.9848143
## 7456	0.0017413498	0.0001377896	0.9848143
## 7457	0.0017413498	0.0001377896	0.9848143
## 7458	0.0021872172	0.0001649403	0.9840756
## 7459	0.0017413498	0.0001377896	0.9848143
## 7460	0.0021872172	0.0001649403	0.9840756
## 7461	0.0017413498	0.0001377896	0.9848143
## 7462	0.0017413498	0.0001377896	0.9848143
## 7463	0.0017413498	0.0001377896	0.9848143
## 7629	0.0080915824	0.0023376336	0.9983542
## 7683	0.0130820150	0.0017139075	0.9925634
## 7722	0.0075186279	0.0017139075	0.9965804
## 8377	0.0010409149	0.0007886936	0.9994592
## 8410	0.0009420240	0.0009003369	0.9999111
## 8457	0.0005246960	0.0002830242	0.9982892
## 8458	0.0019809639	0.0007449857	0.9977519
## 8698	0.0002134170	0.0001377896	0.9985228
## 8710	0.0025774590	0.0004644287	0.9938873
## 8717	0.0035136769	0.0015146620	0.9989448
## 8763	0.0004015726	0.0003363101	0.9991625
## 8887	0.0166437590	0.0020336493	0.9922034
## 8911	0.0021975383	0.0012846671	0.9994707
## 8946	0.0021975383	0.0012846671	0.9994707
## 9215	0.0004556720	0.0003578799	0.9990856
## 9507	0.0078645804	0.0023376336	0.9984747
## 9528	0.0011767463	0.0007529679	0.9991214
## 9722	0.0004726496	0.0002322704	0.9980135
## 9730	0.0034873605	0.0015146620	0.9989663
## 10072	0.0004696044	0.0003517856	0.9990029
## 10125	0.0010415177	0.0003517856	0.9969838
## 10131	0.0002864847	0.0001649403	0.9983163
## 10318	0.0016491116	0.0005461355	0.9971052
## 10624	0.0003526261	0.0001649403	0.9978182
## 10723	0.0005599320	0.0003517856	0.9986838
## 10787	0.0017486192	0.0004794589	0.9962600
## 10958	0.0003691326	0.0003363101	0.9992824
## 11165	0.0012670316	0.0009837388	0.9996942
## 11289	0.0005685359	0.0001377896	0.9953240
## 11306	0.0011284557	0.0007081746	0.9990384
## 11413	0.0010622275	0.0002830242	0.9959318
## 11558	0.0020347715	0.0003902791	0.9942292
## 11586	0.0008269700	0.0003578799	0.9977967
## 11631	0.0005317441	0.0002322704	0.9976975
## 11668	0.0001915234	0.0001377896	0.9987203
## 11692	0.0001822655	0.0001377896	0.9988038
## 11728	0.0013746325	0.0003902791	0.9963256
## 11747	0.0012643335	0.0011826443	1.0001657

```
## 11772 0.0021309650 0.0001377896 0.9813413
## 11774 0.0002823008 0.0002430290 0.9991095
## 11817 0.0004669094 0.0004644287 0.9995253
## 11822 0.0013294151 0.0001649403 0.9904834
## 11898 0.0004737619 0.0001377896 0.9961770
## 11899 0.0042566446 0.0007449857 0.9939653
## 11906 0.0017294032 0.0015146620 1.0004084
## 11982 0.0129126333 0.0019745376 0.9941767
## 11992 0.0068935641 0.0002830242 0.9706258
## 12098 0.0018742526 0.0009837388 0.9989272
## 12212 0.0004199633 0.0003902791 0.9993632
## 12218 0.0016090372 0.0015146620 1.0005072
## 12255 0.0011714073 0.0003902791 0.9969717
## 12256 0.0002271217 0.0001377896 0.9983992
## 12293 0.0005190090 0.0003417509 0.9987645
## 12297 0.0002489319 0.0002430290 0.9992802
## 12307 0.0004390798 0.0003517856 0.9991107
## 12370 0.0001850942 0.0001377896 0.9987783
## 12392 0.0003962368 0.0002830242 0.9988532
## 12438 0.0003891558 0.0003517856 0.9992871
## 12465 0.0003843183 0.0003517856 0.9993042
## 12472 0.0027392817 0.0006212542 0.9954570
## 12487 0.0016943739 0.0003578799 0.9947903
## 12513 0.0002823008 0.0002430290 0.9991095
## 12528 0.0002023221 0.0001377896 0.9986229
## 12543 0.0007647262 0.0004648137 0.9987304
## 12577 0.0045010918 0.0006931425 0.9929482
## 12582 0.0121782298 0.0008277017 0.9829548
## 12643 0.0028410937 0.0001649403 0.9792119
## 12759 0.0002134170 0.0001377896 0.9985228
## 12764 0.0109915778 0.0017865070 0.9944667
## 12808 0.0003843183 0.0003517856 0.9993042
## 12816 0.0014326394 0.0005461355 0.9975972
## 12854 0.0002509106 0.0001377896 0.9981847
```

- there do not seem to be any problems

Perform the necessary calculations to assess the assumption of independence and state if the condition is met or not.

```
## Warning: package 'car' was built under R version 4.0.5

## Loading required package: carData

##
## Attaching package: 'car'

## The following object is masked from 'package:boot':
##
##      logit
```

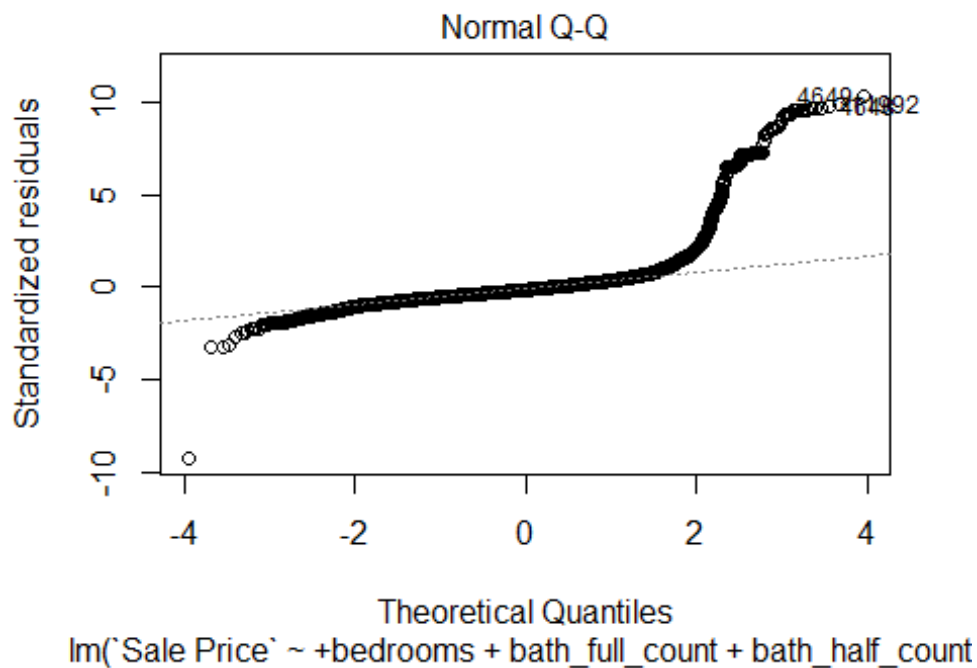
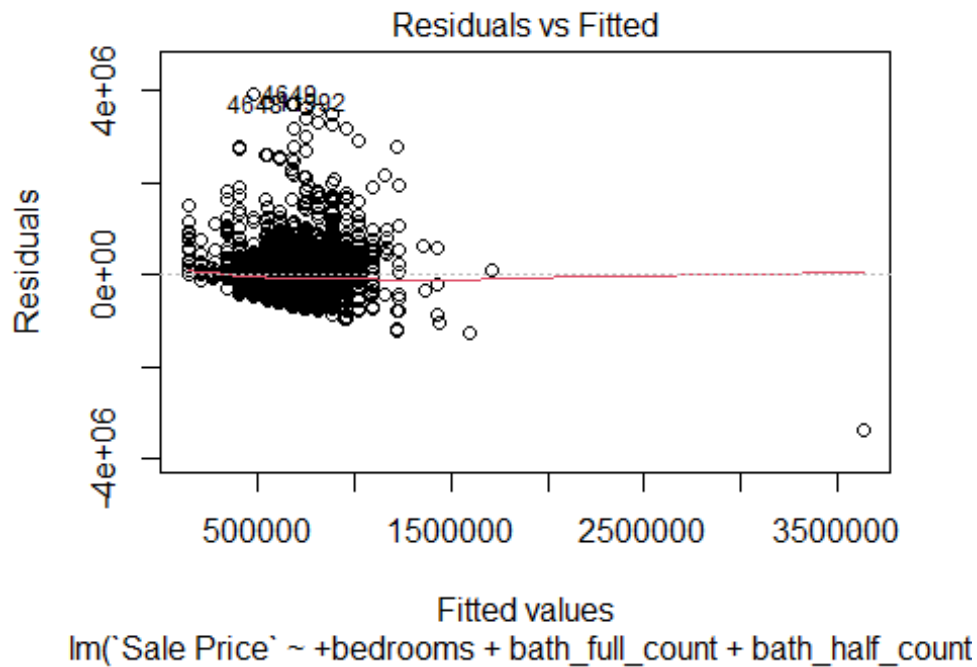
```
## The following object is masked from 'package:dplyr':  
##  
##      recode  
  
## lag Autocorrelation D-W Statistic p-value  
## 1      0.6464067      0.7071849      0  
## Alternative hypothesis: rho != 0
```

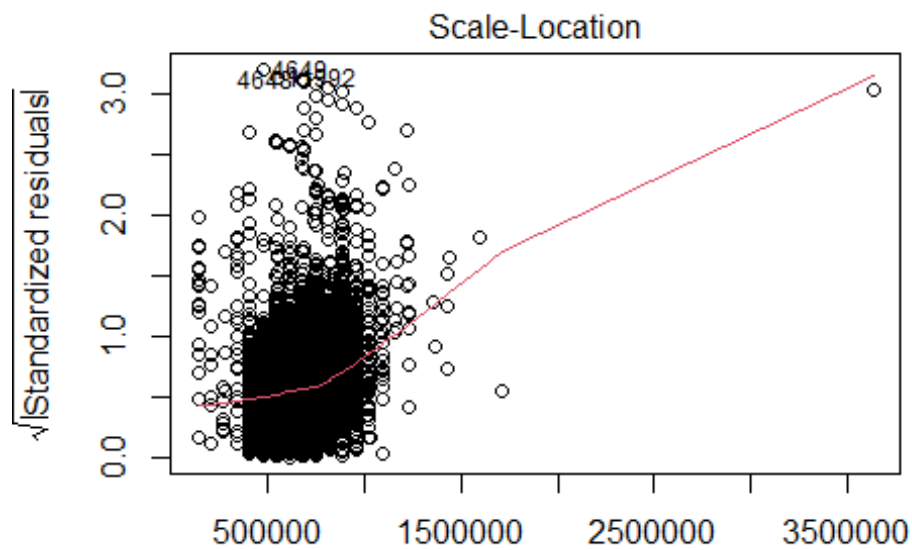
-The condition is met

Perform the necessary calculations to assess the assumption of no multicollinearity and state if the condition is met or not.

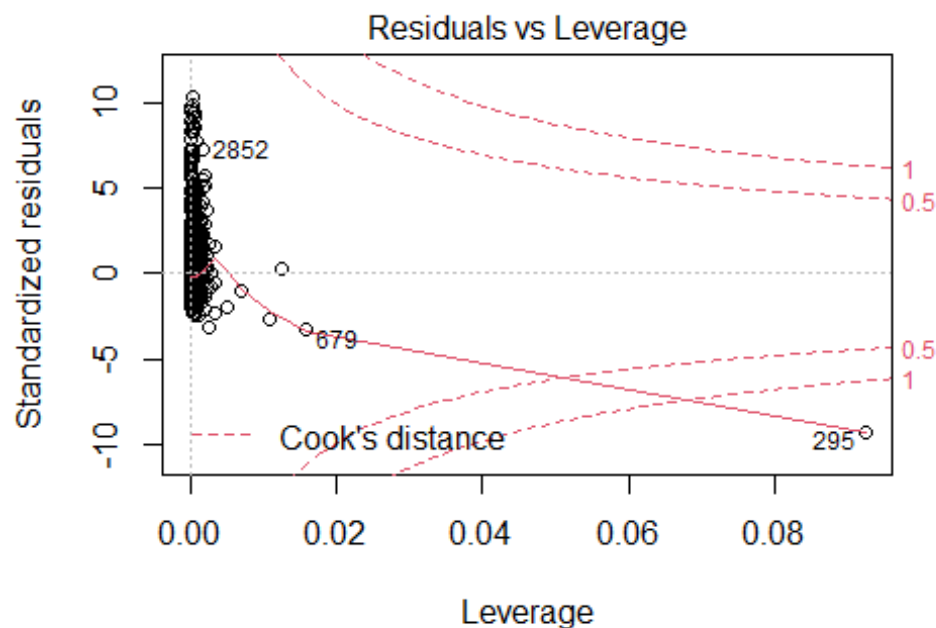
```
##      bedrooms bath_full_count bath_half_count  
##      1.114183      1.138593      1.060911
```

Visually check the assumptions related to the residuals using the `plot()` and `hist()` functions. Summarize what each graph is informing you of and if any anomalies are present.



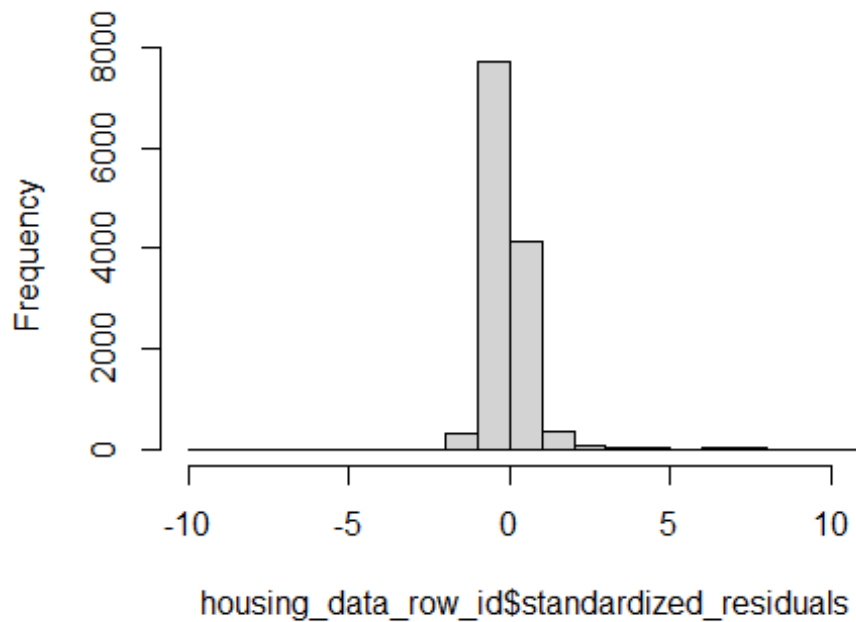


Fitted values
 $\text{lm}(\text{'Sale Price'} \sim +\text{bedrooms} + \text{bath_full_count} + \text{bath_half_count})$



Leverage
 $\text{lm}(\text{'Sale Price'} \sim +\text{bedrooms} + \text{bath_full_count} + \text{bath_half_count})$

stogram of housing_data_row_id\$standardized_res



Overall, is this regression model unbiased? If an unbiased regression model, what does this tell us about the sample vs. the entire population model?

-The model appears to be unbiased to me