

9. Appendix

Table 1: Type A Model Coefficients

Writing Score Model

Covariate	Coefficient
(Intercept)	67.7019116
gendermale	-9.6034239
ethnic_groupgroup B	2.6650499
ethnic_groupgroup C	4.6637096
ethnic_groupgroup D	6.8989050
ethnic_groupgroup E	12.9775727
parent_educbachelor's degree	3.7844797
parent_educhigh school	-6.7840560
parent_educmaster's degree	5.1368571
parent_educsome college	-1.6159435
parent_educsome high school	-6.5646825
lunch_typestandard	1.0114546
test_preptime	-8.8134374
parent_marital_statusmarried	7.4101213
parent_marital_statussingle	-3.9987942
parent_marital_statuswidowed	12.3877539
practice_sportregularly	-3.4486233
practice_sportsometimes	-5.2585836
is_first_childyes	6.1752314
transport_meansschool_bus	5.9968222
wkly_study_hours> 10	-13.4167734
wkly_study_hours10-May	-1.3229981
ethnic_groupgroup B:transport_meansschool_bus	-6.3830679
ethnic_groupgroup C:transport_meansschool_bus	-7.4764593
ethnic_groupgroup D:transport_meansschool_bus	-2.4486808
ethnic_groupgroup E:transport_meansschool_bus	-10.3029259
lunch_typestandard:practice_sportregularly	6.1613706
lunch_typestandard:practice_sportsometimes	10.0219483
lunch_typestandard:wkly_study_hours> 10	5.9187672
lunch_typestandard:wkly_study_hours10-May	-0.0747530
parent_marital_statusmarried:is_first_childyes	-7.6254632
parent_marital_statussingle:is_first_childyes	-0.7356701
parent_marital_statuswidowed:is_first_childyes	-5.7472401
parent_marital_statusmarried:wkly_study_hours> 10	10.2657209
parent_marital_statussingle:wkly_study_hours> 10	18.6798500
parent_marital_statuswidowed:wkly_study_hours> 10	5.9266827
parent_marital_statusmarried:wkly_study_hours10-May	3.3299876
parent_marital_statussingle:wkly_study_hours10-May	8.2992048
parent_marital_statuswidowed:wkly_study_hours10-May	-0.2843766

The proper interpretation of these coefficients is as follows: Holding all other variables constant, one unit increase in [covariate] leads to [coefficient] units increase in the outcome of interest.

Math Score Model

Covariate	Coefficient
(Intercept)	43.4922358
gendermale	5.0562224
ethnic_groupgroup B	3.1098535
ethnic_groupgroup C	4.7866745
ethnic_groupgroup D	4.4789082
ethnic_groupgroup E	19.5605426
parent_educbachelor's degree	22.6141675
parent_educhigh school	-11.9676346
parent_educmaster's degree	-1.9383911
parent_educsome college	0.8824346
parent_educsome high school	1.6695670
lunch_typestandard	5.7052422
test_preptime	-1.1067500
parent_marital_statusmarried	9.7201559
parent_marital_statussingle	3.7791454
parent_marital_statuswidowed	29.2537745
practice_sportregularly	-4.2708885
practice_sportsometimes	-6.0415129
is_first_childyes	12.5726213
transport_meansschool_bus	5.2495442
wkly_study_hours> 10	-4.8803371
wkly_study_hours10-May	4.6584310
ethnic_groupgroup B:transport_meansschool_bus	-4.3676804
ethnic_groupgroup C:transport_meansschool_bus	-7.7457168
ethnic_groupgroup D:transport_meansschool_bus	-0.9133233
ethnic_groupgroup E:transport_meansschool_bus	-10.3518240
parent_educbachelor's degree:parent_marital_statusmarried	-18.4745055
parent_educhigh school:parent_marital_statusmarried	0.7418296
parent_educmaster's degree:parent_marital_statusmarried	1.1992797
parent_educsome college:parent_marital_statusmarried	-7.4231719
parent_educsome high school:parent_marital_statusmarried	-8.2282777
parent_educbachelor's degree:parent_marital_statussingle	-23.6303814
parent_educhigh school:parent_marital_statussingle	1.7140663
parent_educmaster's degree:parent_marital_statussingle	-0.6344053
parent_educsome college:parent_marital_statussingle	-11.5880740
parent_educsome high school:parent_marital_statussingle	-11.5407169
parent_educbachelor's degree:parent_marital_statuswidowed	-33.5004309
parent_educhigh school:parent_marital_statuswidowed	-46.5554305
parent_educmaster's degree:parent_marital_statuswidowed	-48.9590039
parent_educsome college:parent_marital_statuswidowed	-15.7098935
parent_educsome high school:parent_marital_statuswidowed	-19.2637612
parent_educbachelor's degree:is_first_childyes	-3.3589159
parent_educhigh school:is_first_childyes	8.9969202
parent_educmaster's degree:is_first_childyes	4.7183498
parent_educsome college:is_first_childyes	6.6947300
parent_educsome high school:is_first_childyes	2.0435608

Covariate	Coefficient
lunch_typestandard:practice_sportregularly	8.4202603
lunch_typestandard:practice_sportsometimes	11.3662476
lunch_typestandard:transport_meansschool_bus	-3.4367789
test_preptime:is_first_childyes	-3.6884111
test_preptime:wkly_study_hours> 10	-6.2865162
test_preptime:wkly_study_hours10-May	-0.1976361
parent_marital_statusmarried:is_first_childyes	-8.7046743
parent_marital_statussingle:is_first_childyes	-1.9060434
parent_marital_statuswidowed:is_first_childyes	13.7975072
parent_marital_statusmarried:transport_meansschool_bus	7.2707112
parent_marital_statussingle:transport_meansschool_bus	2.4715132
parent_marital_statuswidowed:transport_meansschool_bus	-14.6084845
parent_marital_statusmarried:wkly_study_hours> 10	11.6353641
parent_marital_statussingle:wkly_study_hours> 10	18.6339250
parent_marital_statuswidowed:wkly_study_hours> 10	11.9898110
parent_marital_statusmarried:wkly_study_hours10-May	2.1126896
parent_marital_statussingle:wkly_study_hours10-May	5.6964972
parent_marital_statuswidowed:wkly_study_hours10-May	11.8849084
is_first_childyes:transport_meansschool_bus	-4.4000451
is_first_childyes:wkly_study_hours> 10	-0.6479428
is_first_childyes:wkly_study_hours10-May	-5.6645835

The proper interpretation of these coefficients is as follows: Holding all other variables constant, one unit increase in [covariate] leads to [coefficient] units increase in the outcome of interest.

Reading Score Model

Covariate	Coefficient
(Intercept)	64.0126041
gendermale	-7.9731396
ethnic_groupgroup B	4.0052327
ethnic_groupgroup C	4.5816846
ethnic_groupgroup D	4.6170265
ethnic_groupgroup E	13.9573551
parent_educbachelor's degree	3.3736355
parent_educhigh school	-5.9246720
parent_educmaster's degree	3.4396925
parent_educsome college	-2.3224110
parent_educsome high school	-5.3231611
lunch_typestandard	2.0599169
test_preptime	-6.2162101
parent_marital_statusmarried	10.2556824
parent_marital_statussingle	-0.8882264
parent_marital_statuswidowed	17.2457132
practice_sportregularly	-4.4244752
practice_sportsometimes	-5.4217479
is_first_childyes	8.8087009
transport_meansschool_bus	7.1539912
wkly_study_hours> 10	-15.1279594

Covariate	Coefficient
wkly_study_hours10-May	1.2357744
ethnic_groupgroup B:transport_meansschool_bus	-8.5078012
ethnic_groupgroup C:transport_meansschool_bus	-8.7787161
ethnic_groupgroup D:transport_meansschool_bus	-2.4914229
ethnic_groupgroup E:transport_meansschool_bus	-12.1513487
lunch_typestandard:practice_sportregularly	4.3133911
lunch_typestandard:practice_sportsometimes	9.0693350
lunch_typestandard:wkly_study_hours> 10	6.1826905
lunch_typestandard:wkly_study_hours10-May	-1.3340808
parent_marital_statusmarried:is_first_childdyes	-10.3012497
parent_marital_statussingle:is_first_childdyes	-2.7153494
parent_marital_statuswidowed:is_first_childdyes	-11.5350578
parent_marital_statusmarried:wkly_study_hours> 10	11.8332834
parent_marital_statussingle:wkly_study_hours> 10	20.4572041
parent_marital_statuswidowed:wkly_study_hours> 10	5.7848280
parent_marital_statusmarried:wkly_study_hours10-May	1.7017544
parent_marital_statussingle:wkly_study_hours10-May	5.0454905
parent_marital_statuswidowed:wkly_study_hours10-May	-3.6043323

The proper interpretation of these coefficients is as follows: Holding all other variables constant, one unit increase in [covariate] leads to [coefficient] units increase in the outcome of interest.

Table 2: Multiple and Adjusted R^2 for all models

Outcome Variable/Model	Covariates Only	Covariates and Other Test Scores
Writing	0.4032 / <i>0.362</i>	0.9551 / <i>0.9531</i>
Math	0.4207 / <i>0.3476</i>	0.8939 / <i>0.8888</i>
Reading	0.3254 / <i>0.2789</i>	0.9336 / <i>0.9306</i>

Multiple R^2 is bold, adjusted R^2 is italicized.

Table 3: Type B Model Coefficients

Writing Score with Other Scores as Predictors

Covariate	Coefficient
(Intercept)	1.8887616
gendermale	-6.0578706
ethnic_groupgroup B	-0.4101061
ethnic_groupgroup C	0.5802956
ethnic_groupgroup D	2.1894542
ethnic_groupgroup E	-1.0099243

Covariate	Coefficient
parent_educbachelor's degree	0.9536092
parent_educhigh school	-1.4646427
parent_educmaster's degree	2.4499005
parent_educsome college	0.1507372
parent_educsome high school	-1.6961199
lunch_typestandard	0.2287684
test_preptime	-3.3650862
parent_marital_statusmarried	0.0939641
parent_marital_statussingle	0.2058865
parent_marital_statuswidowed	0.9320512
practice_sportregularly	1.5653436
practice_sportsometimes	0.8226377
is_first_childyes	-0.2082400
transport_meansschool_bus	-1.4653048
wkly_study_hours> 10	-0.3405180
wkly_study_hours10-May	0.0123796
reading_score	0.7290976
math_score	0.4190312
transport_meansschool_bus:reading_score	0.0230636
reading_score:math_score	-0.0016988

The proper interpretation of these coefficients is as follows: Holding all other variables constant, one unit increase in [covariate] leads to [coefficient] units increase in the outcome of interest.

Math Score with Other Scores as Predictors

Covariate	Coefficient
(Intercept)	-9.4478352
gendermale	13.9310258
ethnic_groupgroup B	0.9575902
ethnic_groupgroup C	-0.1500629
ethnic_groupgroup D	-0.8904819
ethnic_groupgroup E	5.2158484
parent_educbachelor's degree	-1.3248714
parent_educhigh school	0.6757209
parent_educmaster's degree	-3.2424452
parent_educsome college	0.1386980
parent_educsome high school	0.7638305
lunch_typestandard	1.5110651
test_preptime	4.1051371
parent_marital_statusmarried	0.2781327
parent_marital_statussingle	-0.1017812
parent_marital_statuswidowed	1.1956141
practice_sportregularly	0.4596391
practice_sportsometimes	0.0950948
is_first_childyes	-1.5827564
transport_meansschool_bus	0.0626096
wkly_study_hours> 10	-4.9391993
wkly_study_hours10-May	-2.9390114

Covariate	Coefficient
reading_score	0.1675506
writing_score	0.7674974
lunch_typestandard:is_first_childdyes	2.5464054
test_preptime:transport_meansschool_bus	-1.3404825
wkly_study_hours> 10:reading_score	0.1000068
wkly_study_hours10-May:reading_score	0.0554654

The proper interpretation of these coefficients is as follows: Holding all other variables constant, one unit increase in [covariate] leads to [coefficient] units increase in the outcome of interest.

Reading Score with Other Scores as Predictors

Covariate	Coefficient
(Intercept)	2.2512938
gendermale	-0.1377977
ethnic_groupgroup B	-0.1399523
ethnic_groupgroup C	-0.8456703
ethnic_groupgroup D	-2.1742851
ethnic_groupgroup E	-0.8495220
parent_educbachelor's degree	-0.3194345
parent_educhigh school	0.9325487
parent_educmaster's degree	-0.9991043
parent_educsome college	-0.5342048
parent_educsome high school	1.3485517
lunch_typestandard	-1.2290996
test_preptime	1.9926513
parent_marital_statusmarried	0.0740501
parent_marital_statussingle	-0.1264861
parent_marital_statuswidowed	-1.4360788
practice_sportregularly	-2.0714620
practice_sportsometimes	-0.7828685
is_first_childdyes	-0.6219640
transport_meansschool_bus	1.1396578
wkly_study_hours> 10	-0.3184942
wkly_study_hours10-May	-0.1845646
writing_score	0.8931576
math_score	0.1209110
is_first_childdyes:transport_meansschool_bus	1.5524335
transport_meansschool_bus:writing_score	-0.0297898

The proper interpretation of these coefficients is as follows: Holding all other variables constant, one unit increase in [covariate] leads to [coefficient] units increase in the outcome of interest.

Explore Diagnostics for These Models

Figure 1: Diagnostic plots for the Writing Type A Model

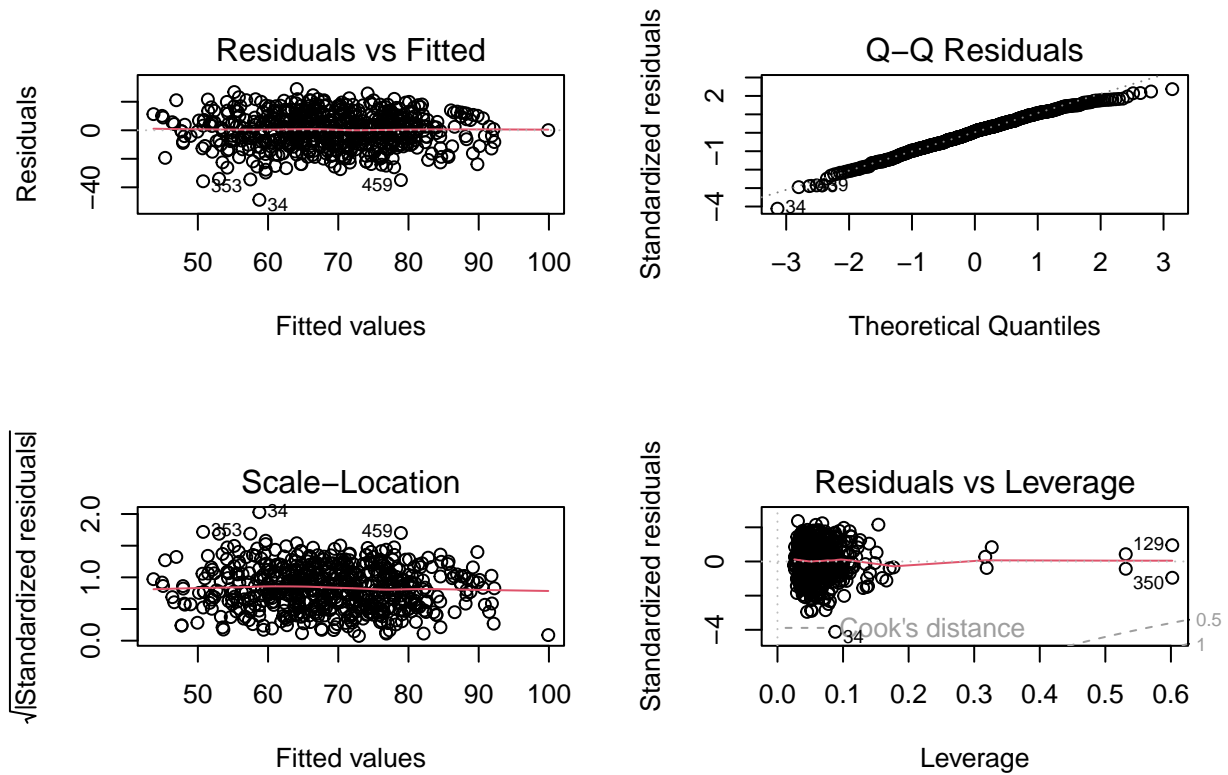


Figure 2: Diagnostic plots for the Math Type A Model

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## Warning: not plotting observations with leverage one:
## 190
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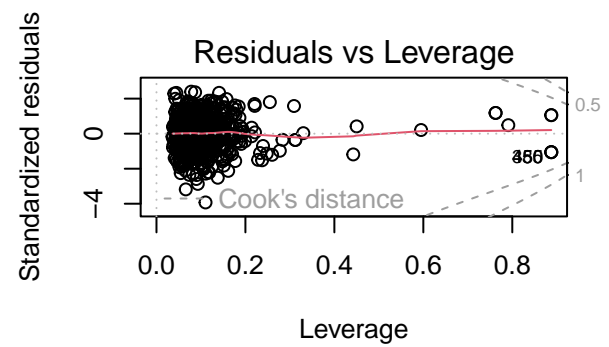
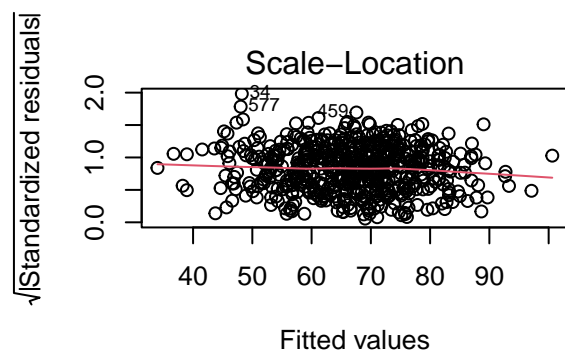
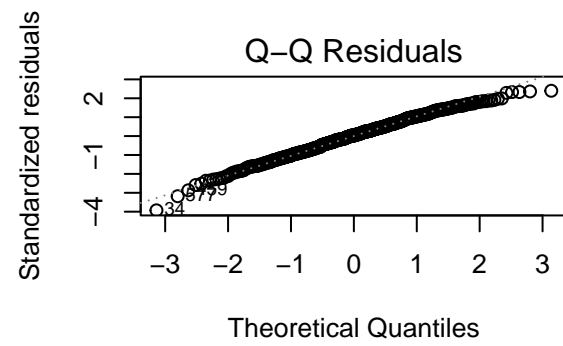
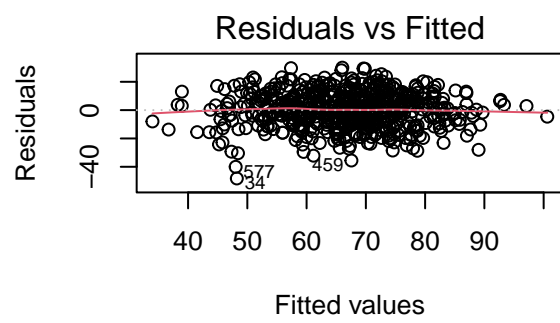


Figure 3: Diagnostic plots for the Reading Type A Model

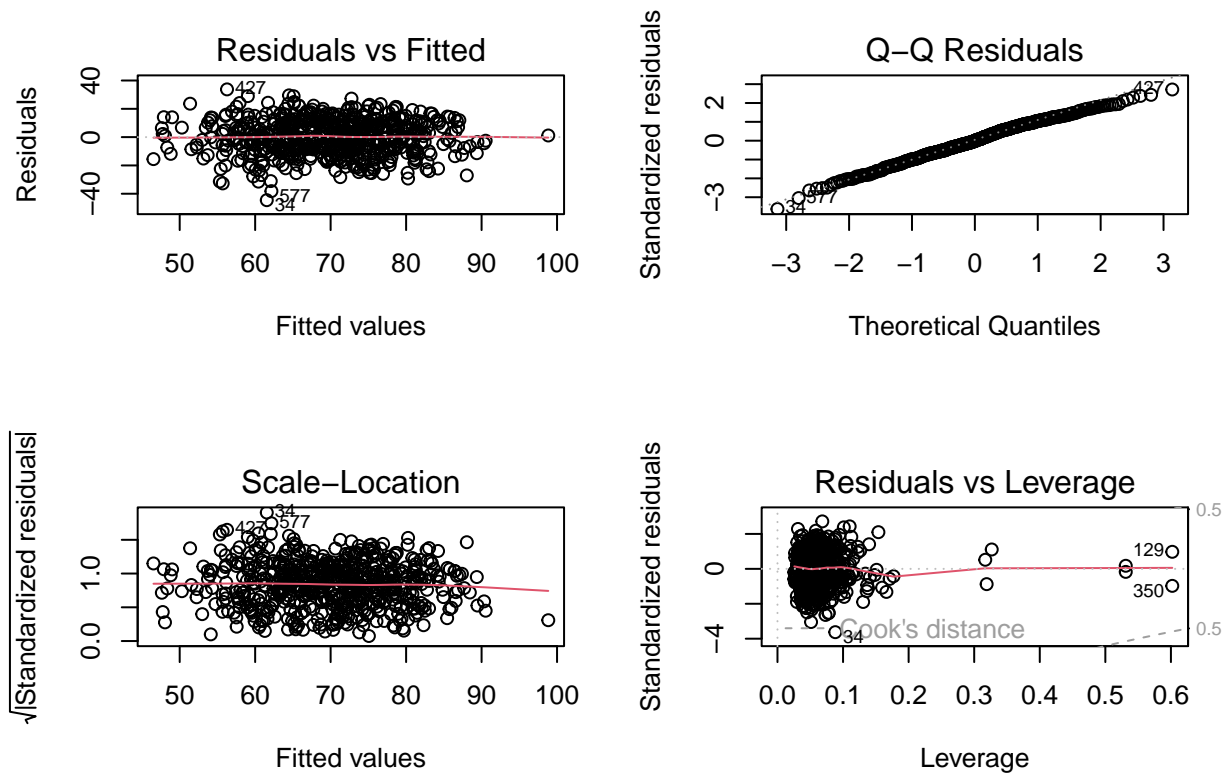


Figure 4: Diagnostic plots for the Writing Type B Model

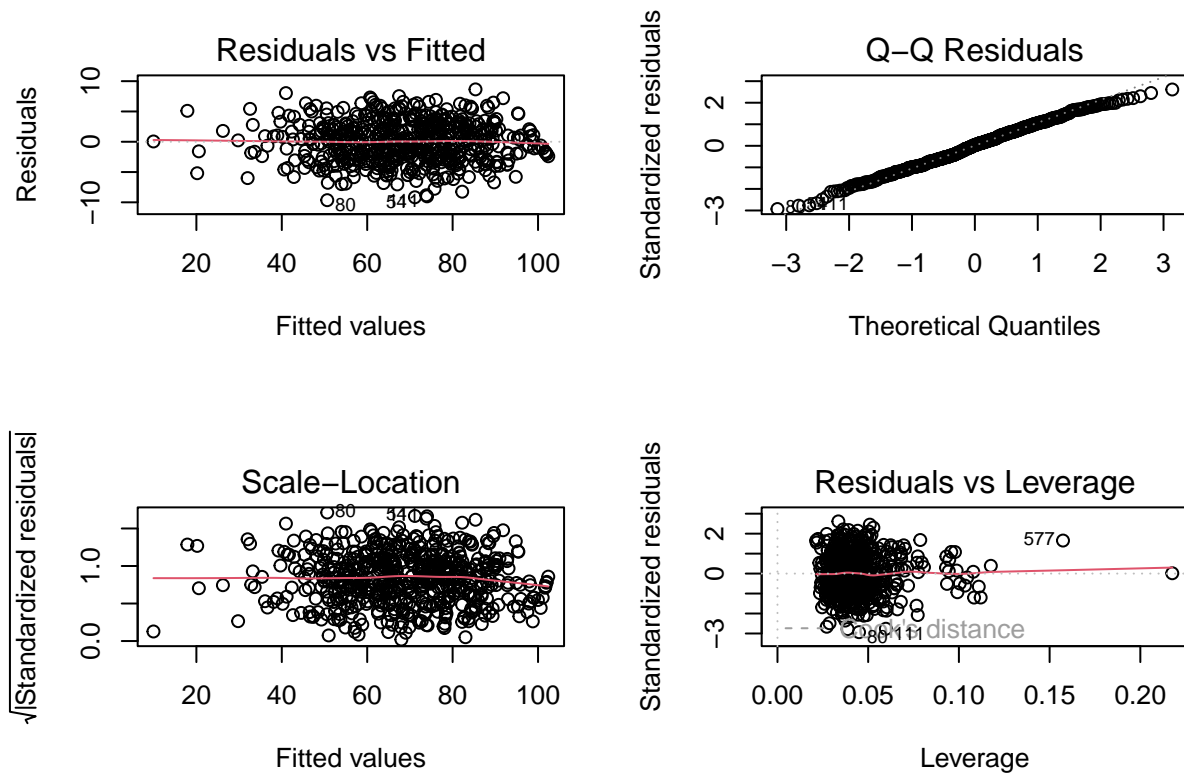


Figure 5: Diagnostic plots for the Math Type B Model

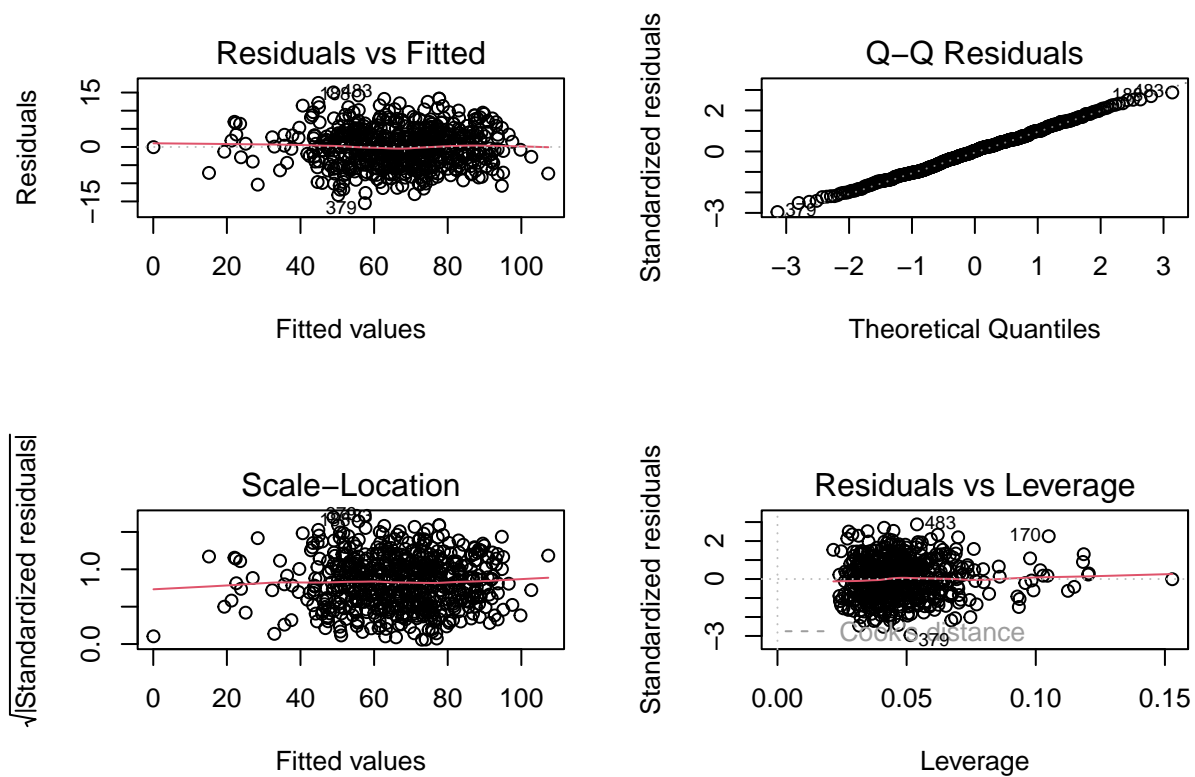


Figure 6: Diagnostic plots for the Reading Type B Model

