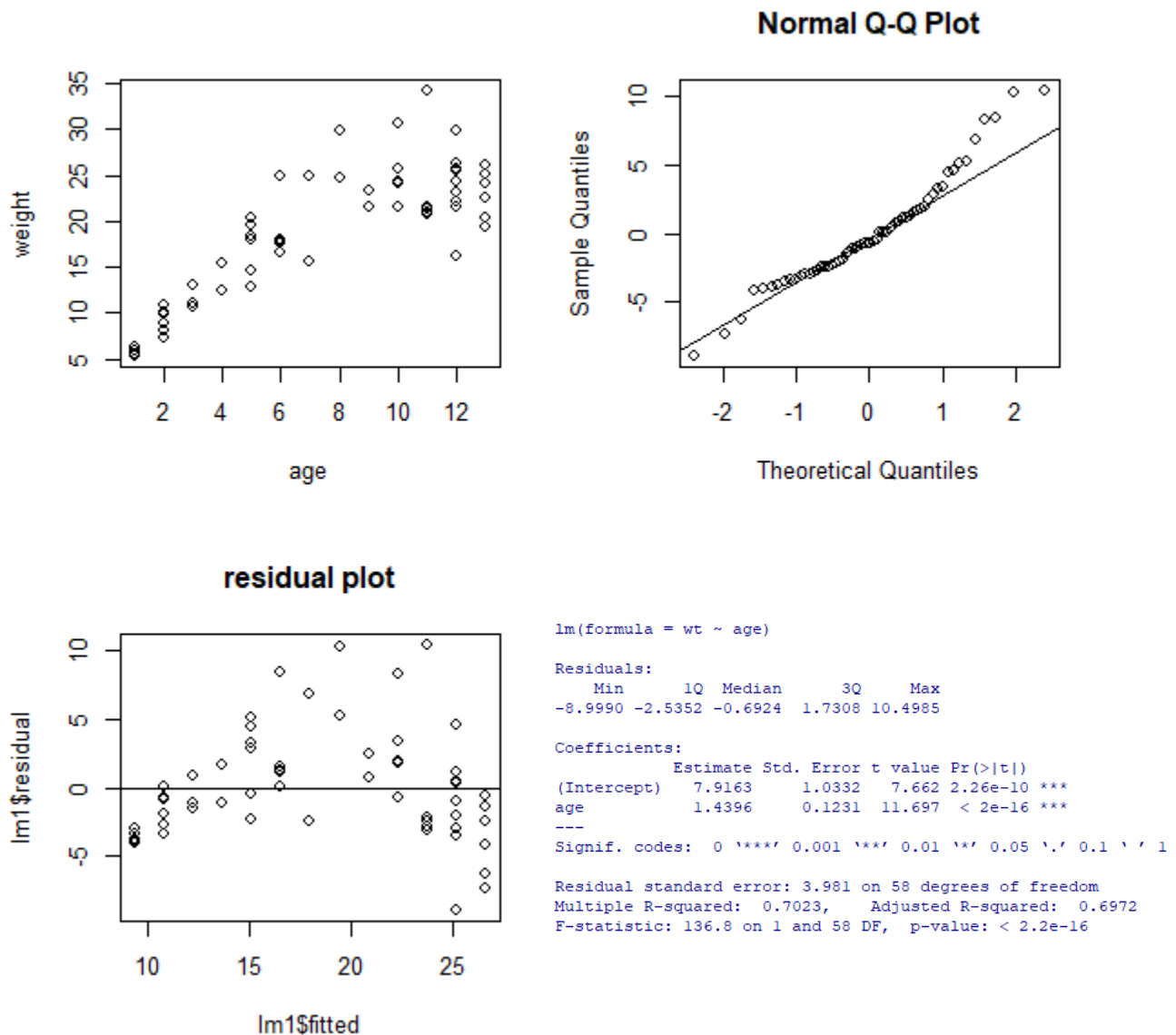Madgyal sheep is indigenous breed of sheep and distributed in Maharashtra state of India. Due to high growth rate, this breed is of special importance for growth traits studies. A study records the body weights (lbs) for 60 lambs and their age (month). A simple linear regression model was implemented to analyze the relation between lamb weight and age. The results are shown below.

Normal Q-Q Plot

residual plot


```
lm(formula = wt ~ age)

Residuals:
    Min      1Q  Median      3Q     Max
-8.9990 -2.5352 -0.6924  1.7308 10.4985

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   7.9163     1.0332   7.662 2.26e-10 ***
age           1.4396     0.1231  11.697  < 2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 3.981 on 58 degrees of freedom
Multiple R-squared:  0.7023,     Adjusted R-squared:  0.6972
F-statistic: 136.8 on 1 and 58 DF,  p-value: < 2.2e-16
```

A. Do the simple linear regression model assumptions appear to be satisfied? Discuss each assumption separately.

B. Regardless of your answer in A. Use the model results to build a 95% prediction interval for a 10-month-old lamb. Use $S_{xx}=719.345$ and $\bar{x}=6.333$

C. Regardless of your answer in A. Use the model results to build a 95% confidence interval for the average weight of lambs that are 10-month-old. Which interval is wider?

D. Can you predict the weight for a 3-year-old lamb? Why or why not?

The analysis was re-run on the log transformed data. The new results are shown below. Use it to answer the following questions E to G.

E. Do the simple linear regression model assumptions appear to be satisfied? Discuss each assumption separately.
F. Discuss the advantage of the log transformation in terms of the linear regression model.
G. Run a hypothesis test to check if there is a significant linear relation between the log of lamb weight and log of lamb age

Normal Q-Q Plot

residual plot


```
lm(formula = logwt ~ logage)

Residuals:
     Min       1Q   Median       3Q      Max
-0.44759 -0.12770 -0.00845  0.11006  0.38607

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.85128    0.05274   35.10   <2e-16 ***
logage       0.55570    0.02760   20.13   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.1725 on 58 degrees of freedom
Multiple R-squared:  0.8748,     Adjusted R-squared:  0.8727
F-statistic: 405.4 on 1 and 58 DF,  p-value: < 2.2e-16
```