3. [25] The regression diagnostics for the “best” model that contains the nine variables: Mileage, Cylinder, Liter, Sound, Buick, Chevrolet, Pontiac, Saturn, and Sedan are computed. Refer to the JMP output entitled “Regression Diagnostics for the “Best” Model”.

   i. [3] According to the distribution of residuals, what values are potential outliers? Give the residual values and the make and model of the vehicles.

   \[
   \text{Residual} = 8.8 \text{ or } 8.76 \quad \text{Chevrolet Corvette}
   \]
   \[
   \text{Residual} = 5.5 \quad \text{SAAB 9_3 HO}
   \]

   ii. [6] Are there any vehicles with statistically significant standardized residuals? If so, what vehicles are they and what are the values of their standardized residuals? Be sure to support your answer statistically.

   \[
   \text{Chevrolet Corvette} \\
   z = \frac{8.76}{2.336} = 3.75 \\
   \text{Prob} > |z| = 0.0002
   \]
   The P-value (0.0002) is less than 0.05/100 = 0.0005 so this standardized residual is statistically significant.

   iii. [2] What value of leverage would be considered high?

   \[
   h > 2(9+1/100) = 0.20
   \]

   iv. [3] Are there any vehicles with high leverage? If so, what vehicles are they and what are the values of their leverage?

   Yes
   \[
   \text{Chevrolet Corvette} \quad h = 0.224 \\
   \text{SAAB 9_3} \quad h = 0.221 \\
   \text{Saturn L Series} \quad h = 0.231
   \]

   v. [5] Compute the value of the F statistic for the vehicle with the highest leverage.

   Is this a statistically significant F statistic? Be sure to support your answer statistically.

   \[
   F = \frac{(0.231 - 0.01)/9}{(1 - 0.231)/90} = 2.874
   \]

   \[
   \text{Prob} > F = 0.00511 \text{ which is greater than 0.0005, so this leverage value is not statistically significant.}
   \]

    No, the largest value of Cook’s D is 0.52 which is not greater than 1.

vii. [3] Are there any vehicles with statistically significant Studentized residuals? If so, what vehicles are they and what are their Studentized residuals?

    Yes, Chevrolet Corvette has a Studentized residual of 4.26 with a P-value = 0.0001 which is less than 0.0005.