Consider the regression model handouts concerning the birth weight data. Carry out an (one!) F test to evaluate whether, when mother’s age and weight are both in the model, the smoking main effect and smoking*gained interaction are simultaneously not needed. Note that you need to write out your null and alternative hypotheses, p-value, conclusion, and summary in the context of the problem. You might need the following output:

```r
> anova(lm(tounces ~ gained + mage))
Analysis of Variance Table

Response: tounces

     Df Sum Sq Mean Sq F value  Pr(>F)
 gained  1 18856  18856 41.487 2.083e-10 ***
  mage    1 10891  10891 23.963 1.195e-06 ***
Residuals 774 351780  454
---
Signif. codes:  0 *** 0.001 ** 0.01 * 0.05 . 0.1 1
```

**Solution:**
Consider the following model:

\[
E[Y] = \beta_0 + \beta_1 \text{gained} + \beta_2 \text{smoke} + \beta_3 \text{mage} + \beta_4 \text{gained} \cdot \text{smoke}
\]

- \( H_0: \beta_2 = \beta_4 = 0 \)
- \( H_a: \) not \( H_0 \)

Our test statistic is calculated using the SSE from the full and reduced models:

\[
F^* = \frac{\text{SSE}(R) - \text{SSE}(F)}{(n-3)-(n-5)} \times \frac{\text{SSE}(F)}{n-5}
= \frac{351780 - 346389}{2} \times \frac{449}{449}
= 6.00
\]

- p-value = \( P(F_{2,772} \geq 6) \)
  = \( 1 - pf(6, 2, 772) \)
  = 0.002595839

There is strong evidence that \( \beta_2 \) and \( \beta_4 \) are not simultaneously zero. That is, we should not remove both smoking and the gained*smoking interaction from the model that predicts baby’s birth weight in ounces.