3.22 The data file *collegetown* contains data on 500 single-family houses sold in Baton Rouge, Louisiana, during 2009–2013. The data include sale price (in \$1000 units), *PRICE*, and total interior area in hundreds of square feet, *SQFT*.

a. Using the linear regression $PRICE = \beta_1 + \beta_2 SQFT + e$, estimate the elasticity of expected house *PRICE* with respect to *SQFT*, evaluated at the sample means. Construct a 95% interval estimate for the elasticity, treating the sample means as if they are given (not random) numbers. What is the interpretation of the interval?

b. Test the null hypothesis that the elasticity, calculated in part (a), is one against the alternative that the elasticity is not one. Use the 1% level of significance. Clearly state the test statistic used, the rejection region, and the test *p*-value. What do you conclude?

c. Using the linear regression model $PRICE = \beta_1 + \beta_2 SQFT + e$, test the hypothesis that the marginal effect on expected house price of increasing house size by 100 square feet is less than or equal to \$13000 against the alternative that the marginal effect will be greater than \$13000. Use the 5% level of significance. Clearly state the test statistic used, the rejection region, and the test *p*-value. What do you conclude?

d. Using the linear regression $PRICE = \beta_1 + \beta_2 SQFT + e$, estimate the expected price, $E(PRICE|SQFT) = \beta_1 + \beta_2 SOFT$, for a house of 2000 square feet. Construct a 95% interval estimate of the expected price. Describe your interval estimate to a general audience.

e. Locate houses in the sample with 2000 square feet of living area. Calculate the sample mean (average) of their selling prices. Is the sample average of the selling price for houses with $SQFT = 20$ compatible with the result in part (d)? Explain.

3.23 The data file *collegetown* contains data on 500 single-family houses sold in Baton Rouge, Louisiana, during 2009–2013. The data include sale price in \$1000 units, *PRICE*, and total interior area in hundreds of square feet, *SQFT*.

a. Using the quadratic regression model, $PRICE = \alpha_1 + \alpha_2 SOFT^2 + e$, test the hypothesis that the marginal effect on expected house price of increasing the size of a 2000 square foot house by 100 square feet is less than or equal to \$13000 against the alternative that the marginal effect will be greater than \$13000. Use the 5% level of significance. Clearly state the test statistic used, the rejection region, and the test *p*-value. What do you conclude?

b. Using the quadratic regression model in part (a), test the hypothesis that the marginal effect on expected house price of increasing the size of a 4000 square foot house by 100 square feet is less than or equal to \$13000 against the alternative that the marginal effect will be greater than \$13000. Use the 5% level of significance. Clearly state the test statistic used, the rejection region, and the test *p*-value. What do you conclude?

c. Using the quadratic regression model in part (a), estimate the expected price $E(PRICE|SQFT) = \alpha_1 + \alpha_2 SQFT^2$ for a house of 2000 square feet. Construct a 95% interval estimate of the expected price. Describe your interval estimate to a general audience.

d. Locate houses in the sample with 2000 square feet of living area. Calculate the sample mean (average) of their selling prices. Is the sample average of the selling price for houses with $SQFT = 20$ compatible with the result in part (c)? Explain.