Lab Nr. 10, Probability and Statistics

Confidence Intervals For Comparing Two Populations

Write Matlab routines that find $100(1-\alpha)\%$ two-sided confidence intervals, for the following:
- the difference of two population means, when the population variances are assumed to be equal;
- the difference of two population means, when the population variances are assumed to be different;
- the ratio of two population variances.

Application

It is thought that the gas mileage obtained by a particular model of automobile will be higher if unleaded premium gasoline is used in the vehicle rather than regular unleaded gasoline. To gather evidence in this matter, 10 cars are randomly selected from the assembly line and tested using a specified brand of premium gasoline; 10 others are randomly selected and tested using the brand's regular gasoline. Tests are conducted under identical controlled conditions and gas mileages for both types of gas are assumed independent and (approximately) normally distributed. These data result:

Premium		**Regular**	
22.4	21.7	17.7	14.8
24.5	23.4	19.6	19.6
21.6	23.3	12.1	14.8
22.4	21.6	15.4	12.6
24.8	20.0	14.0	12.2

a. Assuming $\sigma_1 = \sigma_2$, find a $100(1-\alpha)\%$ confidence interval for the difference of the true means.
b. Assuming $\sigma_1 \neq \sigma_2$, find a $100(1-\alpha)\%$ confidence interval for the difference of the true means.
c. Find a $100(1-\alpha)\%$ confidence interval for the ratio of the variances.