Name: *Caleb McWhorter — Solutions*
MAT 222
Spring 2019
Homework 4

"Is Mayonnaise an instrument?"
–Patrick Star, Spongebob Squarepants

Problem 1: The summary statistics for resting pulse rates are obtained for 26 men and 23 women, and the data is summarized in the table below.

Group	n	$\overline{x}$	s
Male	26	71.65	5.28
Female	23	72.13	7.29

(a) Construct a 99% confidence interval for the mean difference between male and female resting pulse rate.

We have dof $= \min\{26-1, 23-1\} = 22$ *so that* $t^* = 2.819$. *Then we have*

$$(\overline{x}_1 - \overline{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} = (71.65 - 72.13) \pm 2.819 \sqrt{\frac{5.28^2}{26} + \frac{7.29^2}{23}} = -0.48 \pm 2.819(1.839).$$

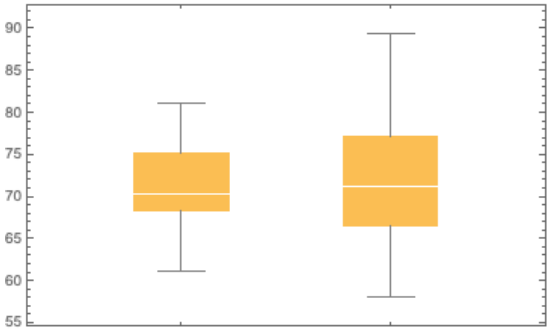
Therefore, we are 99% certain that the true mean of the difference is between -5.66 *and* 4.70*, i.e. we are 99% sure that on average males have a resting heart rate of* -5.66 *bpm less to* 4.70 *bpm more than females.*

(b) Is there a significant difference in mean resting pulse rate between men and women? State an appropriate null and alternative hypothesis, find your test statistic, p-value, and draw your conclusion at $\alpha = 0.05$.

$$\begin{cases} H_0 : \mu_1 = \mu_2 \\ H_a : \mu_1 \neq \mu_2 \end{cases} \qquad t = \frac{(\overline{x}_1 - \overline{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{-0.48 - 0}{1.839} = -0.26 \overset{dof\ 22}{\rightsquigarrow} 0.25$$

So we have $p = 2 \cdot 0.25 = 0.50 \not< \alpha$. *Therefore, we fail to reject the null hypothesis so that the data is consistent with males and females having the same average resting pulse.*

(c) Consider the following side-by-side box-plot obtained for the data. Is it appropriate to use the method you used in (a) to compare the mean resting pulse rates? Justify your response using the plot.



Since our degrees of freedom is 22, we need no skewness or outliers. Each distribution has equal tails and (approximately) equal inner quartiles. Moreover, there are no outliers. Therefore, the methods applied should be appropriate. Notice the StDevs seem to be different, so a pooled test may be inappropriate.