STA260 Tutorial 3 Question 1

Question 1

Let $Y_1, Y_2, ..., Y_n$ be a random sample of size n from a population with mean μ. Show that $\sum_{i=1}^{n} a_i Y_i$ is an unbiased estimator of μ for any set of fixed constants $a_1, a_2, ..., a_n$ satisfying the condition $\sum_{i=1}^{n} a_i = 1$.

WT Prove: $\mathbb{E}\left[\sum_{i=1}^{n} a_i Y_i\right] = \mu$

$$\mathbb{E}\left[\sum_{i=1}^{n} a_i Y_i\right] = \sum_{i=1}^{n} a_i \, \mathbb{E}[Y_i] = \sum_{i=1}^{n} a_i \mu = \mu \underbrace{\sum_{i=1}^{n} a_i}_{=1} = \mu$$

now a constant