

Problem 6

/12

This problem refers to the `garbage_weight` data set, available on Moodle. This set represents a random sample of garbage from 62 suburban homes.

- (a) Construct a level 99% confidence interval for the average amount of glass waste by *direct calculation*. Identify the point estimate, margin of error, and interval endpoints. Make sure your work is clear.

$$\bar{x} = \text{mean}(\text{garbage_weight}\$GLASS) \\ = 3.75$$

$$t^* = qt(.995, 61) \\ = 2.66$$

$$s = \text{sd}(\text{garbage_weight}\$GLASS) \\ = 3.10$$

$$n = 62$$

$$N = \bar{x} \pm t^* \frac{s}{\sqrt{n}}$$

$$N = 3.75 \pm 1.05$$

$$2.70 < \mu < 4.80$$

$$\text{Point estimate} = \bar{x} = 3.75$$

$$E = t^* \frac{s}{\sqrt{n}} = 1.05$$

$$\text{Interval endpoints} = 2.70$$

$$= 4.80$$

- (b) Confirm the results of part (a) with a single line of R code. Include both code and output.

`t.test(garbage_weight$GLASS, conf.level = .99)`

99 percent confidence interval:

2.702495 4.801699

```
> t.test(garbage_weight$GLASS, conf.level = 0.99)

One Sample t-test

data:  garbage_weight$GLASS
t = 9.5048, df = 61, p-value = 1.199e-13
alternative hypothesis: true mean is not equal to 0
99 percent confidence interval:
 2.702495 4.801699
sample estimates:
mean of x
 3.752097
```

- (c) Carefully interpret your answer using the language developed in class.

99% of suburban homes throw out an average of

between 2.70 and 4.80 pounds of glass garbage.

Problem 7

/12

Does the `garbage_weight` set provide evidence that the average food waste per household is more than 3.5 pounds? Follow all best practices from class and test at significance level $\alpha = .05$.

$$H_0: \mu = 3.5$$

$$H_a: \mu > 3.5$$

`t.test(garbage_weight$FOOD, mu=3.50, alternative = "greater")`

```
R 4.3.2 ~ /
> View(garbage_weight)
> help(t.test())
Error in help(t.test()) :
  'topic' should be a name, length-one character vector or reserved word
> help("t.test")
> t.test(garbage_weight$FOOD, mu=3.50, alternative = "greater")

One Sample t-test

data:  garbage_weight$FOOD
t = 3.1425, df = 61, p-value = 0.001293
alternative hypothesis: true mean is greater than 3.5
95 percent confidence interval:
 4.116549      Inf
sample estimates:
mean of x
4.815968
```

$$\bar{x} = \text{mean}(\text{garbage_weight}\$FOOD) = 4.82$$

$$s = \text{sd}(\text{garbage_weight}\$FOOD) = 3.30$$

$$n = 62$$

$$t = \frac{\bar{x} - 3.5}{s/\sqrt{n}} = 3.14$$

$$p = 1 - p^t(t, n-1) = 0.0013$$

$$p < \alpha$$

The data gives sufficient evidence to support the

idea that the average food waste from suburban homes is greater than 3.50 lbs.