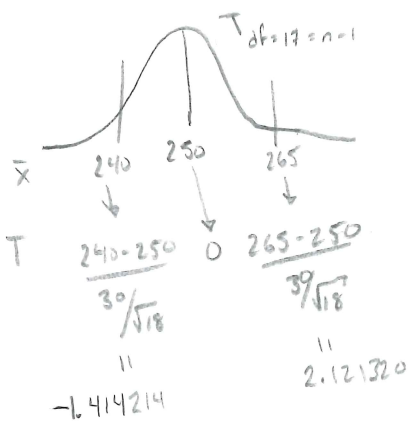
Example 2: A certain utility company states that its customer's natural gas bills for the month of January will vary from one customer to another in accordance with a Normal distribution with a mean of \$250, but $\sigma =$? A small random sample of $n = 10$ customers from January 2016 was taken. The standard deviation of this sample was found to be $S = \$30.00$.

a) If the utility company is to randomly select $n = 18$ customers, what is the probability the mean bill amount will be between \$240.00 and \$265.00?



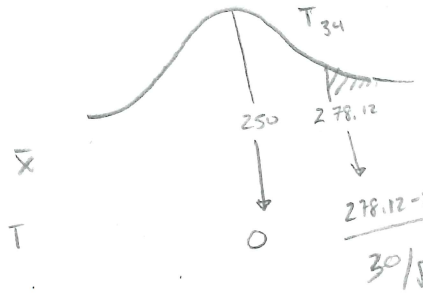
$T = \frac{\bar{x} - \mu}{(s/\sqrt{n})} \sim T_{df=n-1}$

$P(240 < \bar{x} < 265) = P(-1.414214 < T_{17} < 2.121320)$

$\cong pt(2.121320, df=17) - pt(-1.414214, df=17)$

$\cong 0.887857$

b) Suppose a random sample of $n = 35$ customers was taken and their natural gas bills were observed for the month of January 2015. The mean of this sample was found to be \$278.12. Given what we know, how likely is such an outcome?



"Assuming" pop mean $\mu = 250$ and $s = 30$ still

really we should find s of this sample but maybe we don't have the raw data...

$P(\bar{x} > 278.12) \cong P(T_{34} > \frac{278.12-250}{30/\sqrt{35}})$

$= 1 - pt((278.12-250)/(30/(35)^{\wedge}(1/2)), df=34)$

$\cong 1.679422 \times 10^{-6}$ very small very unlikely

Instead, what is more likely? 1. The mean really wasn't \$250 in JAN 15

2. The s of this sample isn't 30...

3. We observed a very rare occurrence...