MATH 1550, LAB 7: DUE: xxxx
HYPOTHESIS TESTS

Performing a t-test (without known sample data)

If the information is given to us, we can assign variables and compute directly. Assume we take level of significance $\alpha = 0.1$. For instance if we are told that a sample of size 53 was collected with sample average 3.2 and the sample standard deviation was 0.5 we could write

```
alpha = 0.1
```

and

```
n = 53
```

and

```
xbar = 3.2
```

and

```
s = 0.5
```

into RStudio, which will store those quantities as variables. If we have the hypotheses

$$\begin{cases} H_0: \mu \leq 3 \\ H_a: \mu > 3 \end{cases}$$

then we could store that mean as

```
muhyp=3
```

Then to compute the test statistic $t = \dfrac{\overline{x} - \mu}{\frac{s}{\sqrt{n}}}$, we would write

```
t=(xbar-muhyp)/(s/sqrt(n))
```

(note: *the placement of parentheses here is important*!)

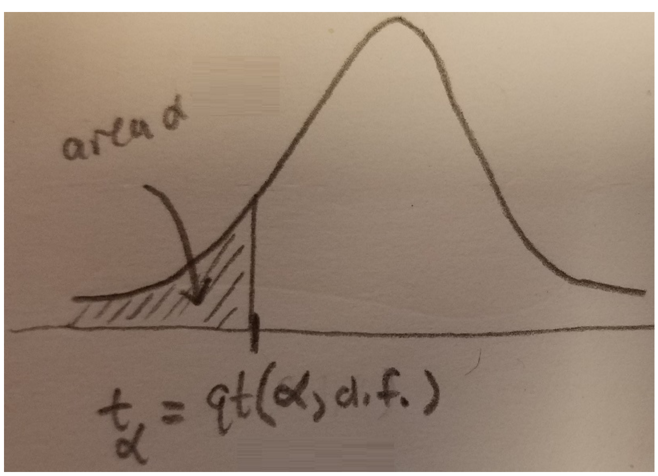
At this point, you pick your favorite way to decide whether or not to reject the null hypothesis.

Using rejection regions

Since this is a right-tailed test, we need to find the critical value t_α. To do this, we use the command

```
qt(alpha, d.f.)
```

The output of this command is as in the following image:



If we were doing a left-tailed test, then we would take the value given by `qt(0.1,52)` which is -1.298045. But since we are doing a right-tailed test, we need to take the value `qt(0.9,52)` which is the positive value 1.298045 (*note: since the t-distributions are symmetric, you can always take the "positive value" to get the critical value for a right-tailed test*).

Completing the test is as simple as comparing the value of our test statistic `t` to the value given by `qt(0.9,52)`. In this problem, $t = 2.912044$ and $t_\alpha = 1.298$ and so the test statistic lies in the rejection region, meaning we **reject** H_0.

Using P-values

Since this is a right-tailed test, you can find the probability associated with the t-value. To do it, we use the `pt` function

```
pt(t,d.f.)
```

So in this problem, we obtain from `pt(t,52)` the value $P = 0.9973$. Since we get $P \leq \alpha$, we **reject** H_0.

Performing a t-test (from a data set)

The only thing different here is that you need to compute the statistics. Suppose that the data is loaded as a data frame named `lab7data` stored in the column named `column1name`. All we need to do is compute the sample average and sample standard deviation. To accomplish this, we can use

```
xbar = average(lab7data$column1name)
```

and

```
s = sd(lab7data$column1name)
```

After you assign the appropriate variables, then do the instructions above.

1. (t test with given data) Suppose the mean weight of panthers found in a wildlife preserve last year was 160.2 pounds. In a sample of 35 panthers in the same wildlife preserve the following year, the mean weight was 153.2 pounds with sample standard deviation of 4.2 pounds. At 0.05 significance level, can we reject the null hypothesis that the mean penguin weight does not differ from last year?
2. (t test with data set) You receive a brochure from a large university. The brochure indicates that the mean class size for full-time faculty is fewer than 32 students. You want to test this claim. You randomly select 18 classes taught by full-time faculty and determine the class size of each. The results appear in the data set `lab7data.csv` that goes wit this lab. At $\alpha = 0.05$, can you support the university's claim?