Question 4

Mechanics agree that the chain on a bicycle should be replaced after covering an average of 3000 miles. StakRide is a new bicycle manufacturing company and it wants to check if the chains it produces for bicycles have a longer life span than the existing average. The lead mechanic randomly selects 25 of the new bicycles and test runs them. The resulting sample mean and standard deviation are 3050 miles and 85 miles, respectively.

A) What hypothesis should be tested to determine whether the life span of StakRide bicycle chains is longer than the known average? (3 marks)

$H_0 : \mu_s \leq \mu_{avg} \quad vs \quad H_a : \mu_s > \mu_{avg}$, One tail test (Upper tail test)

In this case, μ_{avg} is the current mean, and μ_s is the StakRide sampled mean.

b) Assuming that the life span of the bicycle chains is approximately normal, what test statistic would you use to test the hypotheses in part(a)? What is the value of the test statistic for this data? (3 marks)

Since it is a sampled variance, I would use the T-distribution value as the test statistic. The formula being:

When n is large

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} \sim N(0, 1)$$

In [1]:

```
n = 25
df = n-1
xbar = 3050
mu0 = 3000
s = 85

t = (xbar - mu0) / (s/sqrt(n))
t
```

2.94117647058824

c) What conclusion would you reach for a significance level of 0.05. (4 marks)

First, let's look at the T-Table using the new signifigance level and the degrees of freedom:

In [2]:

```
qt(0.05,df, lower.tail = FALSE)
```

1.71088207990943

Given that this is WELL within the rejection region, we have to conclude that we can not reject the null. More specifically, we do not have enough evidence to reject the null.

This does make sense, because the standard deviation (85) is more than big enough to explain a mere 50 mile difference.