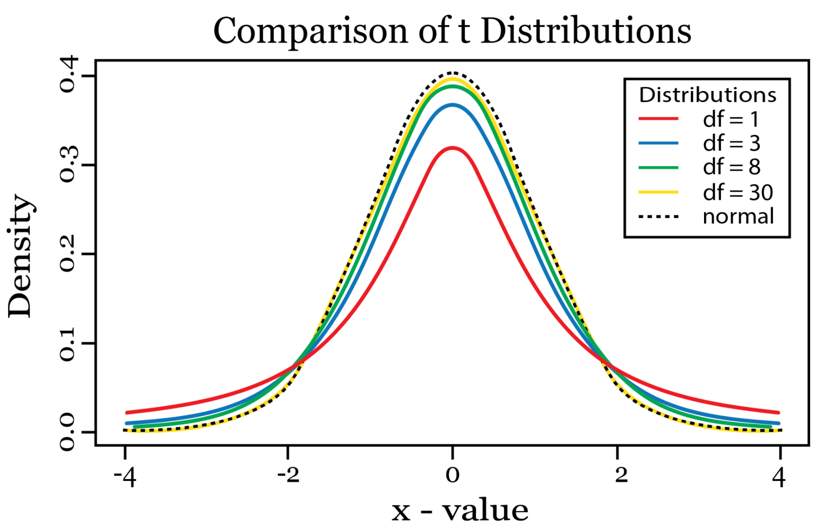
1 Sample t Test

T-tests are very similar to z-tests. They test if a difference we observe is due to chance. We use t-tests and the *t*-Distribution if and only if all 3 of the following conditions are met:

1. The sample is **SMALL**:
2. The histogram for the population is close to the **NORMAL** curve.
3. The SD of the population is **UNKNOWN**.

*****When the sample size is small, using the sample SD to estimate the SD of the population is not very accurate. It is likely to be too low, so we use SD$^+$ instead. And instead of using the normal curve we use the *t*-table.**



Here's how the t-curves compare to the Normal Curve (k represents the degrees of freedom).

Note how the t curves get closer and closer to the Normal Curve as the degrees of freedom increase.

How to compute the SD$^+$:

$$SD^{+} = SD * \sqrt{\frac{n}{n-1}}$$

Note: The SD+ is ALWAYS greater than the SD, but the difference becomes negligible as n gets large.

There's a t-table just like we have the normal table. There is a different curve for each number of *degrees of freedom* where the degrees of freedom = n - 1. The curves are fatter in the tails than the normal curve. This means you need stronger evidence to reject the null.

Puzzle #1: Suppose the Keurig coffee maker claims to brew an 8 oz. cup of coffee in 60 seconds, but I think it actually takes more time than that. To test the coffee maker's claim, I randomly sampled 16 new coffee makers and found the average brewing time to be 64 seconds with an SD of 2 seconds. *Assume the brewing time is approximately normally distributed*.

We want to test whether this difference is due to chance. First of all, what test should we use? Then, perform the appropriate test.