**Problem 1**

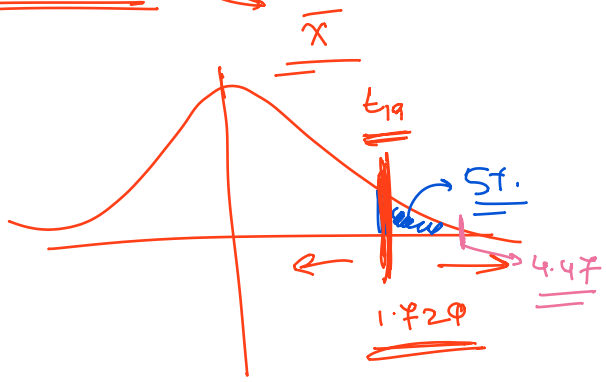
A company claims that their new smartphone battery lasts longer than the industry standard of 24 hours. A sample of 20 batteries was tested, showing an average life of 26 hours with a standard deviation of 2 hours. Test the company's claim at a 0.05 significance level.

$H_0: \mu = 24$

$H_a: \mu > 24$

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

$t = 4.47$




$\Rightarrow$ Reject $H_0$

**Problem 2**

An educational institution claims that its new study method improves student performance, with students scoring 5 points higher on average than the national mean score of 80. For a sample of 25 students who used the method, the average score was 87 with a standard deviation of 10. Test this claim at the 0.01 significance level.

$n$

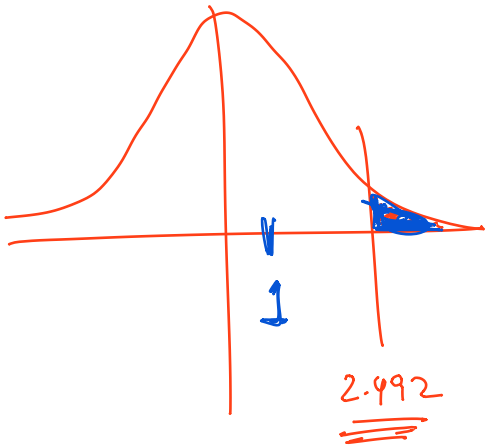
$\bar{x}$

$s$

$H_0: \mu = 85$

$H_a: \mu > 85$

$t = 1$




$\Rightarrow$ Fail to Reject $H_0$

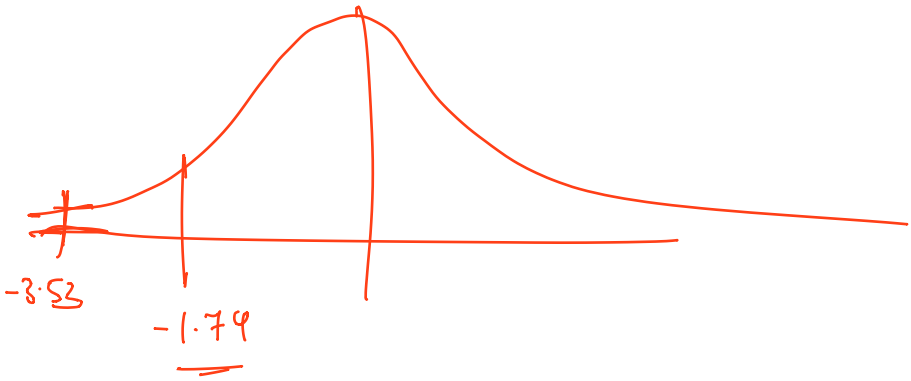
**Problem 3**

The average processing time for a software task is claimed to be 15 seconds. A new algorithm is tested to determine if it improves processing speed. In a sample of 18 trials, the average processing time was 13.5 seconds with a standard deviation of 1.8 seconds. Test at the 0.05 significance level whether the new algorithm reduces processing time.

$H_0: \mu = 15$

$H_a: \mu < 15$

$t = -3.53$




Reject $H_0$

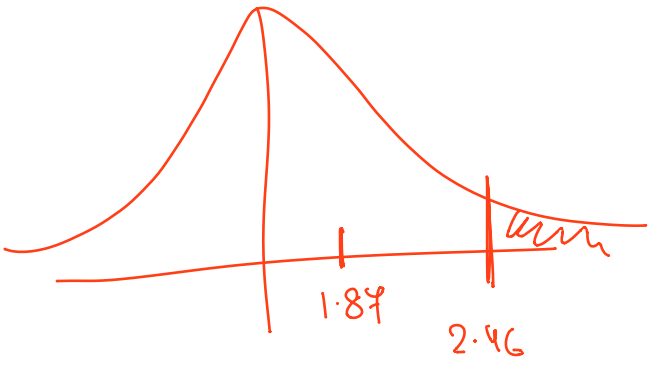
**Problem 4**

A coffee chain claims that their new blend increases customer satisfaction ratings by 2 points on average compared to the standard score of 75. A random sample of 30 customers rated the new blend with an average satisfaction score of 78.2 and a standard deviation of 3.5. Test this claim at a 0.01 significance level.

$H_0: \mu = 77$

$H_a: \mu > 77$

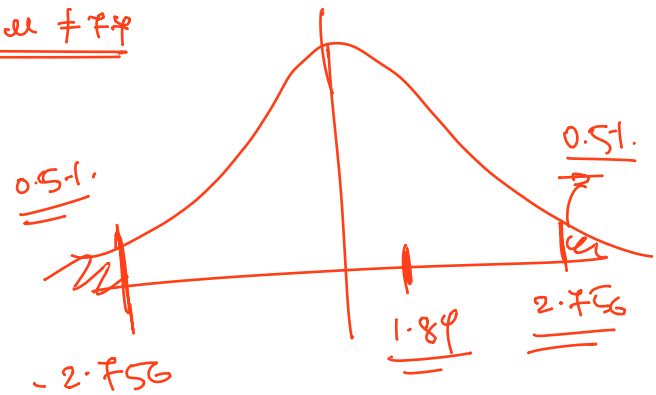
$t = 1.84$




Fail to Reject

$H_a: \mu = 77$

$H_a: \mu \neq 77$




Fail to Reject