

$H_0: X_i \sim N(\mu, \sigma), \sigma$  unknown

$H_1: X_i \sim N(\mu', \sigma), \mu' > \mu$

random variable about "data"

$$T = \frac{\bar{X}_n - \mu}{S_n / \sqrt{n}}$$

$T \sim \text{t-dist}(\text{df} = 20)$

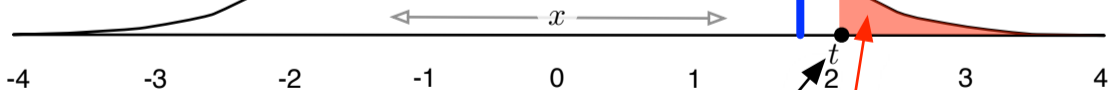
$\text{df} = 20 = n - 1$

$\text{dt}(x, \text{df}=20)$

critical value at  $\alpha$

$$t_\alpha = \text{qt}(1-\alpha, \text{df}=20)$$

$$P(T \leq t_\alpha) = 1 - \alpha$$



realization of data

p-value

$$p = 1 - \text{pt}(t, \text{df} = 20)$$

$$\Pr(T \leq t) = 1 - p$$