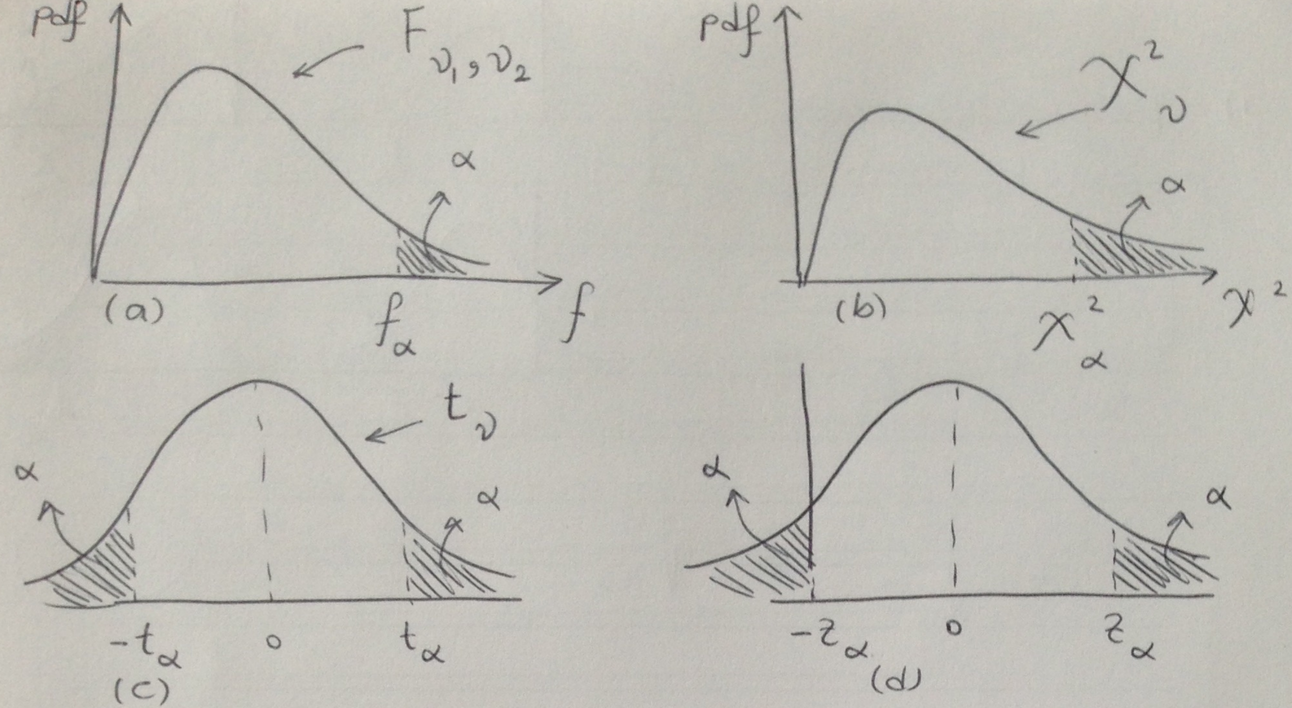


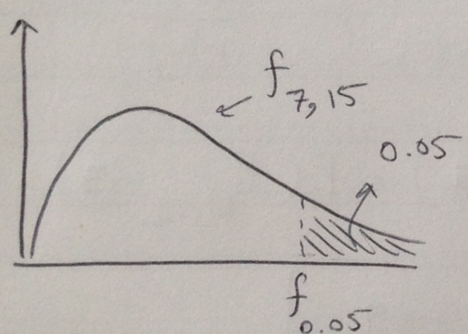
(a) F distribution with ν_1 & ν_2 dof.

(b) Chi-square distribution with ν dof.

(c) t distribution with ν dof.

(d) Standard normal distribution.

1)



(a) $f_{0.05,7,15} = 2.71$

(b) $f_{0.05,15,7} = \dfrac{1}{f_{0.05,7,15}} = \dfrac{1}{2.71}$

(b) $f_{0.05,15,7} = 0.369$ $\boxed{\text{Table A.6}}$

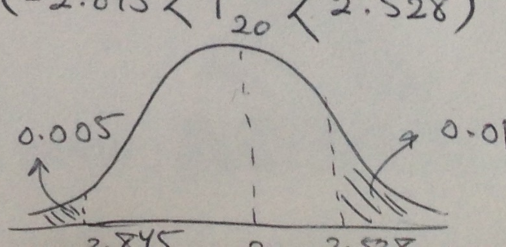
(c) $f_{0.01,24,19} = 2.92$ $\boxed{\text{Table A.6}}$

2). (a) $t_{0.025,14} = 2.145$, (b) $-t_{0.10,10} = -1.372$

(c) $P(-t_{0.005,20} < T_{20} < t_{0.01,20}) = P(-2.845 < T_{20} < 2.528)$

$= 1 - 0.01 - 0.005$

$= 0.985$ $\boxed{\text{Table A.4}}$



3) (a) $\chi^2_{0.005, \nu=5} = 16.75$ $\boxed{\text{table A.5}}$

(b) $\chi^2_{0.05, 19} = 30.144$

4) (a) $\bar{X} = \frac{\sum x_i}{n} = \frac{93.5}{8} = 11.69$

(b) $S^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = 10.77$

5) $n = 16$ Normal $\mu = 50$ $\sigma = 5$ CLT $\Rightarrow \bar{X} \sim N(\underbrace{\mu}_{\mu_{\bar{x}}}, \underbrace{\sigma^2/n}_{\sigma^2_{\bar{x}}})$

$\bar{X} \sim N(50, 25/16)$

$P(\mu_{\bar{x}} - 1.9\sigma_{\bar{x}} < \bar{X} < \mu_{\bar{x}} - 0.4\sigma_{\bar{x}}) = P(-1.9 < \frac{\bar{X} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} < -0.4)$

$= P(-1.9 < Z < -0.4) = 0.3446 - 0.0287 = 0.316$

6) $\sigma_{\bar{x}} = \sigma/\sqrt{n} \Rightarrow 2 = \frac{\sigma}{\sqrt{36}} \Rightarrow \sigma = 12$

$\Rightarrow 1.2 = \frac{12}{\sqrt{n}} \Rightarrow \sqrt{n} = 10 \Rightarrow \boxed{n = 100}$

$\Downarrow$

* To reduce variance of Sample mean, Sample Size should be increased.

7).

Normal
$\mu_1 = 80$
$\sigma_1 = 5$
$\rightarrow n_1 = 25$

$\bar{X}_1 \sim N(80, \sigma^2_{\bar{X}_1} = \frac{25}{25})$

Normal
$\mu_2 = 75$
$\sigma_2 = 3$
$\rightarrow n_2 = 36$

$\bar{X}_2 \sim N(75, \sigma^2_{\bar{X}_2} = \frac{9}{36})$

$\bar{X}_1 - \bar{X}_2 \sim N(5, \frac{25}{25} + \frac{9}{36})$

$$P(3.4 < \bar{X}_1 - \bar{X}_2 < 5.9) = P\left(\frac{3.4-5}{\sqrt{1+\frac{1}{4}}} \leqslant Z \leqslant \frac{5.9-5}{\sqrt{1+\frac{1}{4}}}\right)$$

$$= P\left(\frac{-1.6}{\sqrt{1.25}} \leqslant Z \leqslant \frac{0.9}{\sqrt{1.25}}\right) = P(-1.43 < Z < 0.80)$$

$$= 0.7881 - 0.0764 = 0.7117$$

8) $\bar{X} = \frac{\sum x_i}{n} = \frac{508.6}{16} = 31.78$

$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = 0.68 \implies \frac{\bar{X} - \mu}{s/\sqrt{n}} \sim t_{n-1}$

$$P(\bar{X} > 32) = P\left(\frac{\bar{X} - \mu}{s/\sqrt{n}} > \frac{31 - 30.5}{0.82/4}\right) = P(t_{15} > 2.428)$$

$\cong 0.013$

Table A.4: $\underbrace{t_{0.015,15} = 2.39 \;\&\; t_{0.01,15} = 2.60}$

9) population
$\mu = 30$
$\xrightarrow{n=16}$ $\bar{x} = 27.5$, $s = 5$ $\implies T = \frac{\bar{X} - \mu}{s/\sqrt{n}} \sim t_{n-1}$

$$\left.\begin{array}{l} \implies T = \dfrac{27.5 - 30}{5/4} = -2 \\ t_{0.025,15} = 2.131 \end{array}\right\} \rightarrow \text{Since } -t_{0.025} < T_{15} < t_{0.025}$$

$\Downarrow$

Satisfied

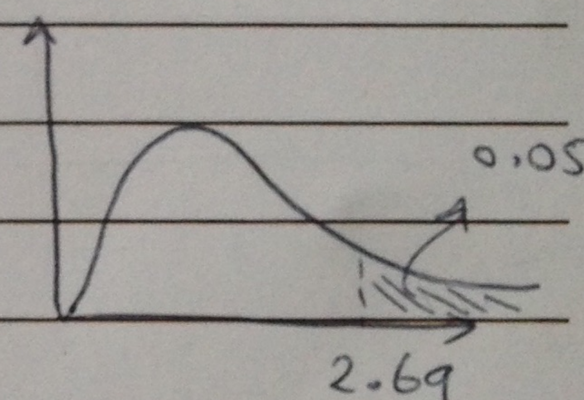
10. Using Samples: $\sigma_1^2 = \sigma_2^2$ (Since they have similar distribution)

$\bar{x}_1 = 0.569$ $\quad S_1^2 = 0.0184$ $\quad \Rightarrow \dfrac{\sigma_2^2 S_1^2}{\sigma_1^2 S_2^2} \sim F_{n_1-1,\, n_2-1}$

$\bar{x}_2 = 0.494$ $\quad S_2^2 = 0.0197$

$$P(S_1^2 < 3S_2^2) = P\left(\frac{S_1^2}{S_2^2} < 3\right) = P(F_{12,12} < 3) =$$

Table A6 : $f_{12,12,0.05} = 2.69$



$\Rightarrow P(F_{12,12} < 3) \geq 0.95$

Confirmed