Statistics

Lecture 23

Feb 19-8:47 AM

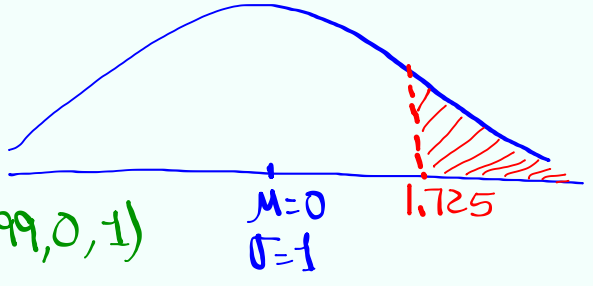
Z - Dist. (Standard Normal Prob. Dist.)

Bell-shape, Symmetric, total Area = 1,

$\mu = 0$, $\sigma = 1$.

$P(Z > 1.725)$

↑ Right Area



= normalcdf(1.725, E99, 0, 1)

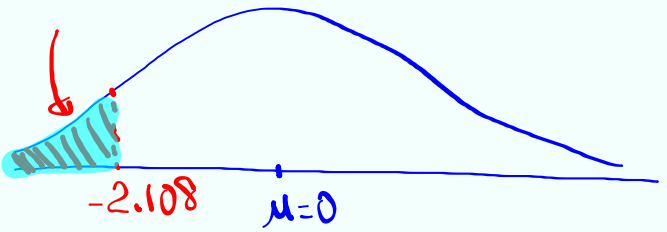
= .042

May 12-1:48 PM

Find twice the area to the left of

$Z = -2.108$.

$P(Z < -2.108)$



$2 * \text{normalcdf}(-E99, -2.108, 0, 1)$

$= .035$

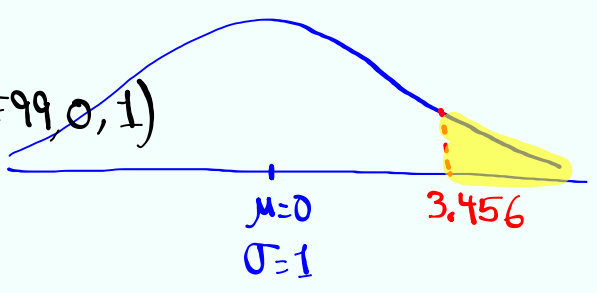
May 12-1:52 PM

Find twice the area to the right of

$Z = 3.456$.

$2 * \text{normalcdf}(3.456, E99, 0, 1)$

$\approx 5.5 \times 10^{-4}$

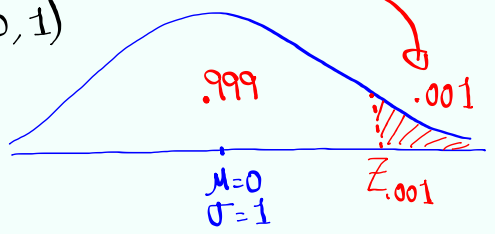


May 12-1:55 PM

Find $z_{.001}$ → Right Area

= invNorm(.999, 0, 1)

≈ 3.090



Find $\pm z_{\alpha/2}$ for 88% Conf. level.

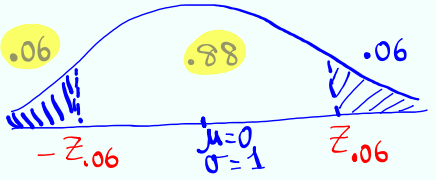
Middle area .88

1 − .88 = .12

.12 ÷ 2 = .06

$z_{.06}$ = invNorm(.94, 0, 1)

≈ 1.555



May 12-1:59 PM

t - Distribution

Bell-shape, Symmetric, total area = 1,

μ = 0, σ unknown, it comes with degrees of freedom.

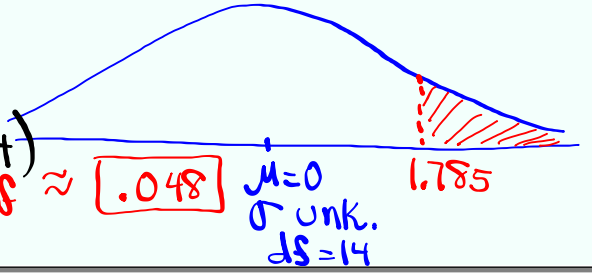
Find P(t > 1.785) with df = 14.

2nd VARS

tcdf(1.785, E99, 14)

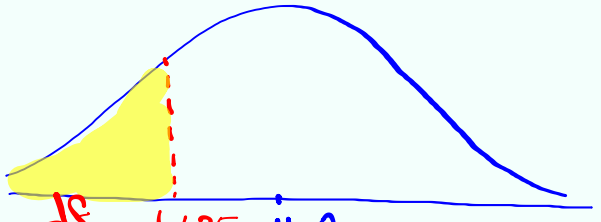
L U df

≈ .048



May 12-2:06 PM

Find twice the area to the left of $t = -1.635$ with $df = 19$.



$2 * tcdf(-E99, -1.635, 19)$

L U df

$= .119$

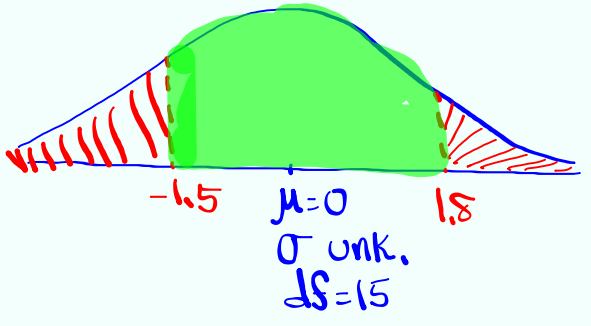
May 12-2:11 PM

Find $P(t < -1.5 \text{ OR } t > 1.8)$ with $df = 15$.

$= 1 - tcdf(-1.5, 1.8, 15)$

Total Area

$= .123$



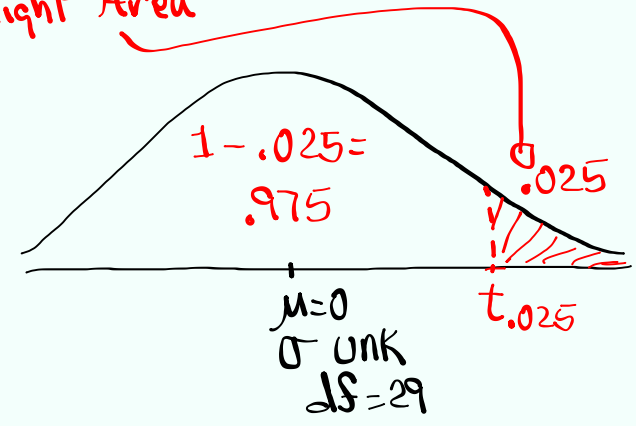
May 12-2:14 PM

Find $t_{.025}$ with $df = 29$.

↳ Right Area

$= invT(.975, 29)$

$= \boxed{2.045}$



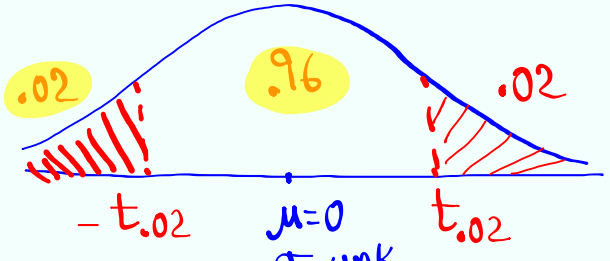
May 12-2:18 PM

Find $\pm t_{\alpha/2}$ for 96% C-level and $df = 49$.

Middle Area .96

$1 - .96 = .04$

$.04 \div 2 = .02$

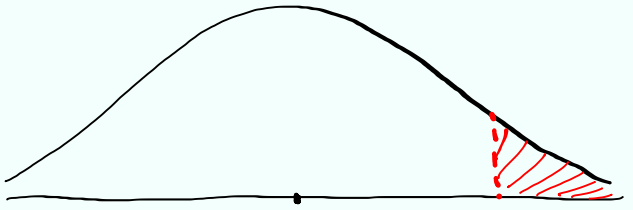


$t_{.02} = invT(.98, 49) \approx \boxed{2.110}$

May 12-2:21 PM

Find $P(t > 4.567)$ with $df = 99$.

Right Area



$= tcdf(4.567, E99, 99) \approx \boxed{7.1 \times 10^{-6}}$

σ unk.

$df = 99$

May 12-2:25 PM

Chi – Square Dist.

χ^2

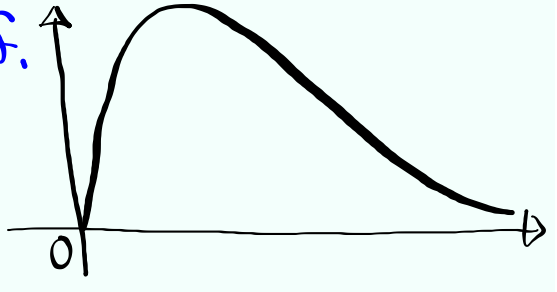
1) Graph starts at 0, and positively Skewed.

2) Not Symmetric, but total area = 1.

3) It comes with df.

2nd VARS

$\chi^2 cdf(L, U, df)$

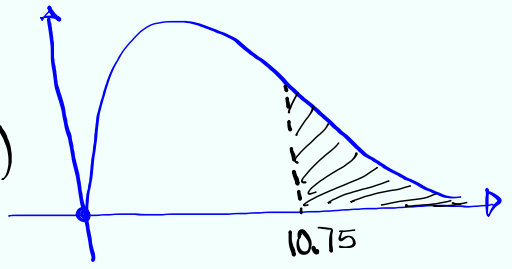


May 12-2:28 PM

Find the area to the right of $\chi^2 = 10.75$ with df = 7.

$\chi^2cdf(10.75, E99, 7)$

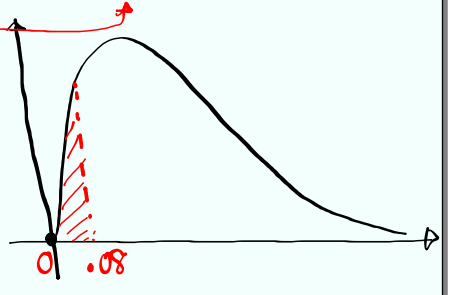
$= .150$



Find the area to the left of $\chi^2 = .08$ with df = 5.

$\chi^2cdf(0, .08, 5)$

$\approx 9.4 \times 10^{-5}$



May 12-2:32 PM

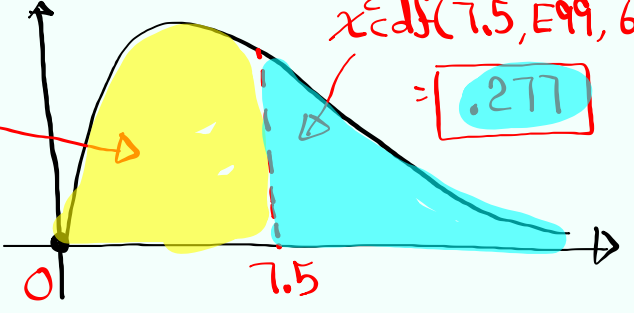
Find the area on each side of $\chi^2 = 7.5$ with df = 6, Multiply Smaller area by 2.

$\chi^2cdf(0, 7.5, 6)$

$= .723$

$\chi^2cdf(7.5, E99, 6)$

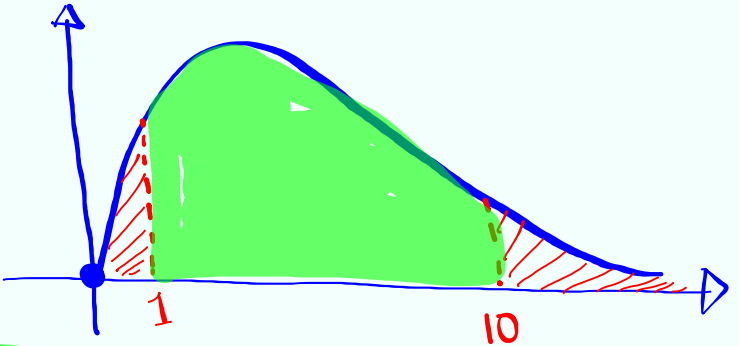
$= .277$



$2 * (.277) = .554$

May 12-2:37 PM

Find $P(\chi^2 < 1 \text{ OR } \chi^2 > 10)$ with df = 9.



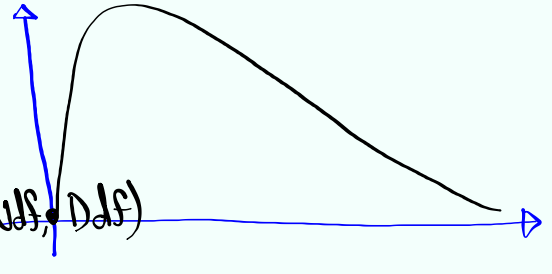
$= 1 - \chi^2 cdf(1, 10, 9) \approx$ .351

May 12-2:42 PM

F - Dist.

1) It is similar to χ^2 - Dist.
Starts at 0, skewed to right,
Not Symmetric, Total area = 1.

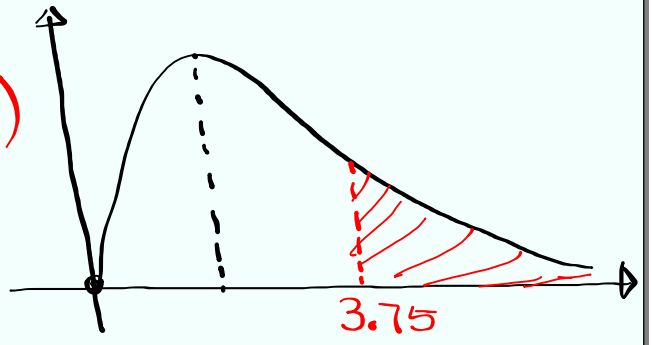
2) It comes with two degrees of freedom.
Ndf ← Numerator df
Ddf ← Denominator df



2nd
VARS
fcdf(L, U, Ndf, Ddf)

May 12-2:46 PM

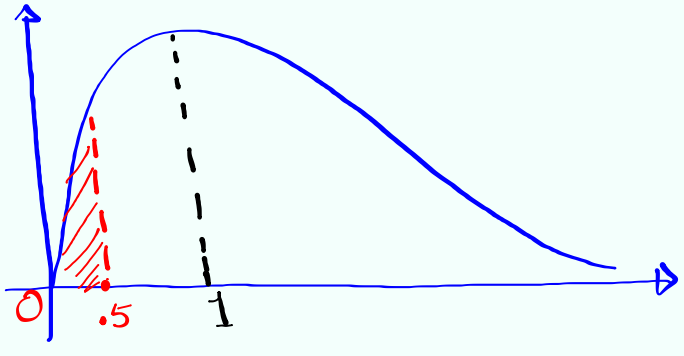
Find the area to the right of $F = 3.75$ with $Ndf = 4$ & $Ddf = 19$.



fcdf(3.75, E99, 4, 19)
= .021

May 12-2:50 PM

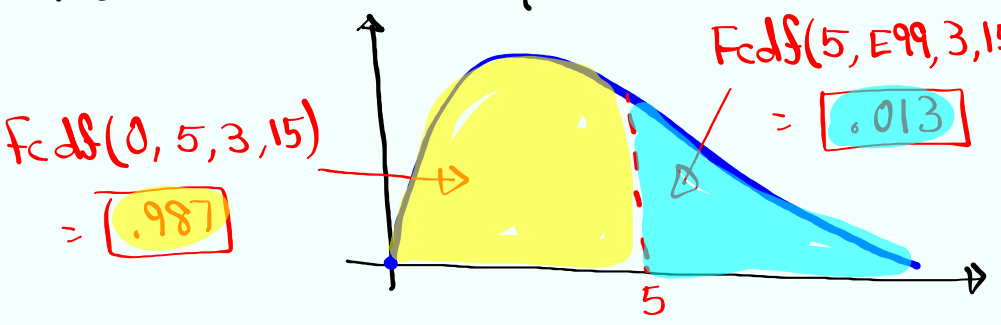
Find twice the area to the left of $F = .5$ with $Ndf = 3$ & $Ddf = 12$.



2 * fcdf(0, .5, 3, 12) = .621

May 12-2:54 PM

Find the area on each side of $F=5$ with $Ndf=3$ & $Ddf=15$, then multiply the smaller area by 2.

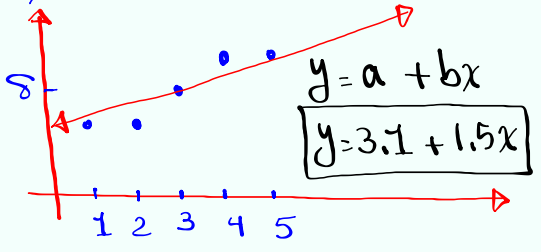


$2*(.013) = .026$

May 12-2:58 PM

x	y
3	8
2	5
4	10
1	5
5	10

1) Scatter Plot



$y = a + bx$

$\hat{y} = 3.1 + 1.5x$

$x \to L1$, $y \to L2$ → LinReg(a+bx)

$a = 3.1$

$b = 1.5$

$r^2 = .893$

$r = .945$

89% of Y-values are explained by x-values.

r is close to 1 ⇒ Linear Correlation is Significant.

May 12-3:04 PM

STAT → TESTS ↓ LinReg T Test

t = 5

p = .015

df = 3

a = 3.1

b = !

r^2 = !

r = !

Xlist: L1

Ylist: L2

Freq List: clear

Rho → ρ ≠ 0

Reg EQ: clear

Calculate

May 12-3:10 PM

Given $n = 215$, $x = 80$ C-level: .98

Find Conf. interval for pop. proportion.

1-PropZInt

$.30 < p < .45$

$E = \frac{.45 - .30}{2} = .075$

$\hat{p} = \frac{.45 + .30}{2} = .375$

May 12-3:15 PM

Given $n = 28$, $\bar{x} = 125$, $\sigma = 15$

Find conf. interval for pop. mean.

σ Known → Z Interval

σ unknown → T Interval

$119 < \mu < 131$

May 12-3:18 PM

Given $n = 18$ $\bar{x} = 33.5$ $S = 8.2$

C-level: .99

find conf. interval for pop. mean.

T Interval

(σ unknown)

$27.9 < \mu < 39.1$

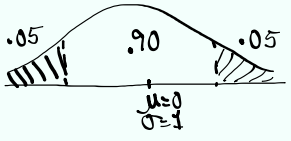
May 12-3:22 PM

Find min. Sample Size needed for 90% Conf. interval for pop. prop. if we wish error not to exceed 2.5%.

$$n = \hat{p}\hat{q}\left(\frac{z_{\alpha/2}}{E}\right)^2$$ Always Round-up

$$= (.5)(.5)\left(\frac{1.645}{.025}\right)^2 = 1082.41$$

≈ 1083



$z_{\alpha} = \text{invNorm}(.95,0,1)$

May 12-3:25 PM