# Continuous Distributions

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| Distribution | Definition | Para | EX/VX | R |
| Normal | f(x) = 1/(σ√(2π)) \* exp(-(x-μ)^2/(2σ²)) | μ, σ | E[X]=μ, Var[X]=σ² | dnorm(x, mean=μ, sd=σ) pnorm(x, mean=μ, sd=σ) qnorm(p, mean=μ, sd=σ) rnorm(n, mean=μ, sd=σ) |
| Chi-square | χ² = Σ Zi², Zi~N(0,1) | df=k | E[X]=k, Var[X]=2k | dchisq(x, df=k) pchisq(x, df=k) qchisq(p, df=k) rchisq(n, df=k) |
| t | T = Z / sqrt(W/ν), Z~N(0,1), W~χ²ν | df=ν | E[T]=0 (ν>1) Var=ν/(ν-2) (ν>2) | dt(x, df) pt(x, df) qt(p, df) rt(n, df) |
| F | F=(U/a)/(V/b), U~χ²a, V~χ²b | df1=a, df2=b | No closed form | df(x, df1=a, df2=b) pf(x, df1=a, df2=b) qf(p, df1=a, df2=b) rf(n, df1=a, df2=b) |
| Exponential | f(x)=λ e^(−λx), x≥0 | rate=λ | E[X]=1/λ, Var[X]=1/λ² | dexp(x, rate=λ) pexp(x, rate=λ) qexp(p, rate=λ) rexp(n, rate=λ) |

## relationship

- Normal----- t , χ², F:  
 · Z ~ N(0,1)  
 · χ²ν = Σ Z\_i²  
 · tν = Z / sqrt(χ²ν/ν)  
 · F\_{a,b} = (χ²a/a) / (χ²b/b)