18:  
The *Pareto distribution* with parameter a>0 has PDF f(x)=a/x^{a+1} for x>=1 (and 0 otherwise).

1. Find the CDF of a Pareto r.v. with parameter a; check that it is a valid CDF

CDF (*F(x)*) is the integral of PDF:

for

for

When the probability is zero

The final solution of CDF: for

To check if is valid:

1. is monotonic increasing because as monotonic increasing because as increase, decrease, thus increase.
2. When , approach 1; when ,
3. The values of range from 0 to 1, satisfying the requirement of CDF.
4. Suppose that for a simulation you want to run, you need to generate i.i.d. Pareto(a) r.v.s. You have a computer that knows how to generate i.i.d. Unif(0,1) r.v.s but does not know how to generate Pareto r.v.s. Show how to do this

Assuming Pareto r.v.s. is X and Unif(0,1) r.v.s is U. According to *inverse transform sampling*:

The Pareto r.v.s. .

