# Activity: convergence in distribution

## Convergence in distribution of sample extremes

Suppose that $X_1, X_2, ...$ are iid random variables from a Pareto distribution with cdf

$$F(x) = \begin{cases} 1 - \left(\frac{1}{x}\right)^{\alpha} & x \geq 1 \\ 0 & x < 1 \end{cases}$$

where $\alpha > 0$. Let $X_{(n)} = \max\{X_1, ..., X_n\}$, and $Y_n = n^{-1/\alpha} X_{(n)}$. Show that as $n \to \infty$,

$$F_{Y_n}(t) \to e^{-t^{-\alpha}}$$

for all $t > 0$.