④ ⓑ $\int\int pdf = \int cdf = E(x)$

$$pdf = P[X=x] = \frac{\alpha-1}{X_{min}}\left(\frac{x}{X_{min}}\right)^{-\alpha}$$

$$cdf = P[X \geq x] = \int_{x_{min}}^{\infty} \frac{\alpha-1}{X_{min}}\left(\frac{x}{X_{min}}\right)^{-\alpha} dx$$

$$= \int_{X_{min}}^{\infty} \frac{(\alpha-1)\, X_{min}^{\alpha-1}}{X^{\alpha}}\, dx$$

$$= (\alpha-1)\, X_{min}^{\alpha-1} \int_{X_{min}}^{\infty} \frac{1}{X^{\alpha}}\, dx$$

$$= (\alpha-1)\, X_{min}^{\alpha-1} \cdot \left[\frac{X^{1-\alpha}}{1-\alpha}\right]_{X_{min}}^{\infty}$$

$$= (\alpha-1)\, X_{min}^{\alpha-1} \cdot \left[\frac{\infty^{1-\alpha}}{1-\alpha} - \frac{X_{min}^{1-\alpha}}{1-\alpha}\right]$$

$$ccdf = 1 - cdf = 1 - \left((\alpha-1)(X_{min}^{\alpha-1})\left[\frac{\infty^{1-\alpha}}{1-\alpha} - \frac{X_{min}^{1-\alpha}}{1-\alpha}\right]\right)$$