1) $f(x) \propto 1/(1+x)^n$ $\quad n > 0$

$0 < x < \infty$

A) *Normalize* $f(x)$

$$\int_0^\infty 1/(1+x)^n \, dx = \left. \frac{(1+x)^{1-n}}{1-n} \right|_0^\infty$$

- For $n > 1$ $\quad 1-n$ is negitive

$(1+\infty)^{-\#} = 1/\infty^{\#} = 0$

$$= 0 - \frac{(1+0)^{1-n}}{1-n} = -\frac{1}{1-n}$$

$$\boxed{f(x) = -\frac{1-n}{(1+x)^n} \qquad \begin{matrix} n > 0 \\ 0 < x < \infty \end{matrix}}$$

$$\int_0^\infty f(x)\,dx = -(x+1)^{1-n} \Big|_0^\infty = 0 + 1 = 1 \quad \checkmark$$

B) $P(x) = \int_0^x -(1-n)/(1+x)^n \, dx$

$$= -(x+1)^{1-n} \Big|_0^x = -(x+1)^{1-n} + (1)^{1-n}$$

$$= -(x+1)^{1-n} + 1 = r$$

$$-r + 1 = +(x+1)^{1-n}$$

$$(-r+1)^{1/1-n} = x+1$$

$$\boxed{(-r+1)^{1/1-n} - 1 = X(r)}$$