Group SBS, Sheet 01, Exercise 02

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By definition, we know that the cdf of Geometric distribution is given as follows,

$$\sum_{i=1}^{x} p(1-p)^{i-1} = 1 - \sum_{x+1}^{\infty} p(1-p)^{i-1} \text{ ....taking the complement} \tag{1}$$
$$= 1 - \big(p(1-p)^{x} + p(1-p)^{x+1} + ...\big) \tag{2}$$
$$= 1 - p(1-p)^{x}\big[1 + (1-p) + (1-p)^{2}.....\big] \tag{3}$$

Since $1 + r + r^2 + r^3 + ... = \frac{1}{1-r}, |r| < 1$, (Geometric series)

$$= 1 - \frac{p(1-p)^{x}}{1-(1-p)} \tag{4}$$
$$= 1 - (1-p)^{x} \tag{5}$$

Hence, proved.

$$\tag{6}$$