Laguerre polynomials

Verify that

$$x\frac{d^2}{dx^2}L_{n\alpha}(x) + (\alpha + 1 - x)\frac{d}{dx}L_{n\alpha}(x) + nL_{n\alpha}(x) = 0 \tag{1}$$

where $L_{n\alpha}(x)$ is the associated Laguerre polynomial

$$L_{n\alpha}(x) = \frac{e^x}{x^\alpha n!}\frac{d^n}{dx^n}(x^{n+\alpha}e^{-x})$$

For integer α the following formula can be used.

$$L_{n\alpha}(x) = (n+\alpha)!\sum_{k=0}^{n}\frac{(-x)^k}{(n-k)!(\alpha+k)!k!}$$