

Quantum Mechanics

Table of Associated Laguerre Polynomials

Obtained with the equation $L_{q-p}^p = (-1)^p \frac{d^p}{dx^p} L_q$

These are the polynomials needed for the radial wave function of the electron in the hydrogen atom.

$$L_0^0 = 1$$

$$L_1^0 = -x + 1$$

$$L_0^1 = 1$$

$$L_2^0 = x^2 - 4x + 2$$

$$L_1^1 = -2x + 4$$

$$L_2^1 = 2$$

$$L_3^0 = -x^3 + 9x^2 - 18x + 6$$

$$L_2^1 = 3x^2 - 18x + 18$$

$$L_1^2 = -6x + 18$$

$$L_0^3 = 6$$

$$L_4^0 = x^4 - 16x^3 + 72x^2 - 96x + 24$$

$$L_3^1 = -4x^3 + 48x^2 - 144x + 96$$

$$L_2^2 = 12x^2 - 96x + 144$$

$$L_1^3 = -24x + 96$$

$$L_0^4 = 24$$

$$L_5^0 = -x^5 + 25x^4 - 200x^3 + 600x^2 - 600x + 120$$

$$L_4^1 = 5x^4 - 100x^3 + 600x^2 - 1200x + 600$$

$$L_3^2 = -20x^3 + 300x^2 - 1200x + 1200$$

$$L_2^3 = 60x^2 - 600x + 1200$$

$$L_1^4 = -120x + 600$$

$$L_0^5 = 120$$

$$L_6^0 = x^6 - 36x^5 + 450x^4 - 2400x^3 + 5400x^2 - 4320x + 720$$

$$L_5^1 = -6x^5 + 180x^4 - 1800x^3 + 7200x^2 - 10800x + 4320$$

$$L_4^2 = 30x^4 - 720x^3 + 5400x^2 - 14400x + 10800$$

$$L_3^3 = -120x^3 + 2160x^2 - 10800x + 14400$$

$$L_2^4 = 360x^2 - 4320x + 10800$$

$$L_1^5 = -720x + 4320$$

$$L_0^6 = 720$$

$$L_7^0 = -x^7 + 49x^6 - 882x^5 + 7350x^4 - 29400x^3 + 59920x^2 - 35280x + 5040$$

$$L_6^1 = 7x^6 - 294x^5 + 4410x^4 - 29400x^3 + 88200x^2 - 119840x + 35280$$

$$L_5^2 = -42x^5 + 1470x^4 - 17640x^3 + 88200x^2 - 176400x + 119840$$

$$L_4^3 = 210x^4 - 5880x^3 + 52920x^2 - 176400x + 176400$$

$$L_3^4 = -840x^3 + 17640x^2 - 105840x + 176400$$

$$L_2^5 = 2520x^2 - 35280x + 105840$$

$$L_1^6 = -5040x + 35280$$

$$L_0^7 = 5040$$

$$L_8^0 = x^8 - 64x^7 + 1568x^6 - 18816x^5 + 117600x^4 - 376320x^3 + 564480x^2 - 322560x + 40320$$

$$L_7^1 = -8x^7 + 448x^6 - 9408x^5 + 94080x^4 - 470400x^3 + 1128960x^2 - 1128960x + 322560$$

$$L_6^2 = 56x^6 - 2688x^5 + 47040x^4 - 376320x^3 + 1411200x^2 - 2257920x + 1128960$$

$$L_5^3 = -336x^5 + 13440x^4 - 188160x^3 + 1128960x^2 - 2822400x + 2257920$$

$$L_4^4 = 1680x^4 - 53760x^3 + 564480x^2 - 2257920x + 2822400$$

$$L_3^5 = -6720x^3 + 161280x^2 - 1128960x + 2257920$$

$$L_2^6 = 20160x^2 - 322560x + 1128960$$

$$L_1^7 = -40320x + 322560$$

$$L_0^8 = 40320$$

$$L_9^0 = -x^9 + 81x^8 - 2592x^7 + 42336x^6 - 381024x^5 + 1905120x^4 - 5080320x^3 + 6531840x^2 - 3265920x + 362880$$

$$L_8^1 = 9x^8 - 648x^7 + 18144x^6 - 254016x^5 + 1905120x^4 - 7620480x^3 + 10240960x^2 - 13063680x + 3265920$$

$$L_7^2 = -72x^7 + 4536x^6 - 108864x^5 + 1270080x^4 - 7620480x^3 + 22861440x^2 - 30481920x + 13063680$$

$$L_6^3 = 504x^6 - 27216x^5 + 544320x^4 - 5080320x^3 + 22861440x^2 - 45722880x + 30481920$$

$$L_5^4 = -3024x^5 + 136080x^4 - 2177280x^3 + 15240960x^2 - 45722880x + 45722880$$

$$L_4^5 = 15120x^4 - 544320x^3 + 6531840x^2 - 30481920x + 45722880$$

$$L_3^6 = -60480x^3 + 1632960x^2 - 13063680x + 30481920$$

$$L_2^7 = 181440x^2 - 3265920x + 13063680$$

$$L_1^8 = -362880x + 3265920$$

$$L_0^9 = 362880$$

$$L_{10}^0 = x^{10} - 100x^9 + 4050x^8 - 86400x^7 + 1058400x^6 - 7620480x^5 + 31752000x^4 - 72576000x^3 + 81648000x^2 - 36288000x + 3628800$$