$-\frac{d^2 y_n}{dx^2} + x y_n = \lambda_n y_n$

on $0 \leqslant x \leqslant \infty$, with $y(0) = y(\infty) = 0$.

To this equation the solution is:

$y_n = C_1 \mathrm{Ai}(x - \lambda_n)$

Where $C_1$ is an arbitrary constant, and $-\lambda_n$ are the zeros of the Airy function, $\mathrm{Ai}(x)$, on the negative x axis, i.e. $\mathrm{Ai}(-\lambda_n) = 0 \quad \forall\, n$.

| $n$ | $\lambda_n$ |
|---|---|
| 1 | 2.33811 |
| 2 | 4.08795 |
| 3 | 5.52056 |
| 4 | 6.78671 |
| 5 | 7.94413 |
| 6 | 10.0402 |

To numerically integrate this solution let us use a Chebyshev spectral method. If $t_m$ comprises points on the Chebyshev extrema grid, that is:

$t_m = -\cos\left(\frac{\pi m}{N}\right), \qquad m \in [0, 1, 2, \ldots, N]$

then:

$x_m = L\left(\frac{1+t_m}{1-t_m}\right)$

.

This is a rational transformation from the Chebyshev extrema grid to the semi-infinite domain.