DLN 1.2.3

We assume $\lambda_j = \lambda_\infty + \gamma \delta^{-j} + hot$

where hot = higher order terms.

Then,

$$\lambda_j - \lambda_{j-1} = \lambda_\infty + \gamma \delta^{-j} - \lambda_\infty - \gamma \delta^{-j+1} + hot,$$

$$= \gamma/\delta^j - \gamma/\delta^{j-1} + hot$$

$$= \frac{\gamma}{\delta^j}(1-\delta) + hot$$

$$\lambda_{j+1} - \lambda_j = \frac{\gamma}{\delta^{j+1}}(1-\delta) + hot$$

$$\frac{\lambda_j - \lambda_{j-1}}{\lambda_{j+1} - \lambda_j} = \frac{\gamma/\delta^j \; (1-\delta)}{\gamma/\delta^{j+1} \; (1-\delta)} + hot = \delta + hot$$

In the limit $j \to \infty$, $hot \to 0$, which

gives

$$\boxed{\lim_{j \to \infty} \frac{\lambda_j - \lambda_{j-1}}{\lambda_{j+1} - \lambda_j} = \delta}$$