

$$a'_n(t) = - \sum_{k=1}^{n-1} \frac{1}{2} k \pi a_k(t) a_{n-k}(t) - \sum_{k=n+1}^N \frac{1}{2} k \pi a_k(t) a_{k-n}(t) - \nu \frac{1}{2} (n\pi)^2 a_n(t)$$