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We propose a "new" method

Advantages:

- produces Hecke eigenforms in closed form if suitably many eigenvalues are known
- does not make (explicit) use of modular forms of integral weight
- gives explicit closed formulas for Fourier coefficients

Warning:

- Some computations have still to be done for the most general case
- have only partial results yet

"new":

- actually I used the same method a decade ago for computing Jacobi forms.

§2 ~~General~~ Basic ingredients

Shimura Lift (Shimura, Niwa, ...)
For every
$t > 0$ squarefree integer, the application

$$f = \sum_{n \geq 1} a_f(n) q^n \longmapsto \sum_{n \geq 1} A(n) q^n$$

$$\left(\sum A(n) n^{-s} = L\left(\chi\left(\tfrac{-4t}{\cdot}\right), s\right) \sum \frac{a_f(tn^2)}{n^s} \right)$$

defines a map

$$S_{t,\chi} : S_{3/2}(4N, \chi) \longrightarrow S_2(2N, \chi^2)$$

which commutes with Hecke-ops $T(p)$ (say $\gcd(p, 2N) = 1$).