12b. Generic abelian eigenfunction modules

See §3.4.2.2

Eigenfunction equation

In[◦]:= `Clear[f, nu, j, bt]`
`{deq, rel} = efeqa[h, 0, 0, f, bt] /. p → 0 // Simplify`

Out[◦]= $\left\{ \frac{1}{12} \times \left(48 + h^2 - 4 j^2 - 12 \, nu^2 - 48 \, \pi^2 \, t^2 \, Abs[beta]^2\right) f[0, t] + t \left(-3 \, f^{(0,1)}[0, t] + t \, f^{(0,2)}[0, t]\right), \right.$

$\left. (h - 2 j) (h + j - 3 \, nu) (h + j + 3 \, nu) \, f[0, t] \right\}$

We can choose $h = 2 j$ to satisfy the second component.

Expected form of solutions in **ff**.

In[◦]:= `Clear[bf, tau]`
`ff = t ^ 2 bf[2 Pi Abs[beta] t]`
`deq /. h → 2 j /. f[0, t] → ff /. f^(0,ee_)[0, t] :→ D[ff, {t, ee}] // Simplify`
`% /. t → tau / (2 Pi Abs[beta]) // Simplify`

Out[◦]= $t^2 \, bf[2 \, \pi \, t \, Abs[beta]]$

Out[◦]= $t^2 \left(-\left((nu^2 + 4 \, \pi^2 \, t^2 \, Abs[beta]^2\right) bf[2 \, \pi \, t \, Abs[beta]]\right) +$
$\quad 2 \, \pi \, t \, Abs[beta] \left(bf'[2 \, \pi \, t \, Abs[beta]] + 2 \, \pi \, t \, Abs[beta] \, bf''[2 \, \pi \, t \, Abs[beta]]\right))$

Out[◦]= $\left(tau^2 \left(-\left((nu^2 + tau^2) bf[tau]\right) + tau \left(bf'[tau] + tau \, bf''[tau]\right)\right)\right) / \left(4 \, \pi^2 \, Abs[beta]^2\right)$

This is the modified Bessel differential equation.