rewriting b0-b3:

$$b_0 = \frac{1}{a_0}$$

$$b_1 = \frac{\frac{1-a_0\cdot\frac{1}{a_0}}{z} - a_1\cdot\frac{1}{a_0}}{a_0} = \frac{\frac{1-1}{z} - \frac{a_1}{a_0}}{a_0} = -\frac{\frac{a_1}{a_0}}{\frac{a_0}{1}} = -\frac{a_1}{a_0^2}$$

$$b_2 = \frac{\frac{1-\left(a_0\cdot\left(-\frac{a_1}{a_0^2}\right) + \left(a_1\cdot\frac{1}{a_0}\right)\right)\cdot z^1 - \left(a_0\cdot\frac{1}{a_0}\right)\cdot z^0}{z^2} - a_1\cdot\left(-\frac{a_1}{a_0^2}\right) - \frac{a_2}{a_0}}{a_0}$$

$$= \frac{\frac{1-\left(-\frac{a_1}{a_0} + \frac{a_1}{a_0}\right)\cdot z^1 - 1}{z^2} + \frac{a_1^2}{a_0^2} - \frac{a_2}{a_0}}{a_0}$$

$$= \frac{\frac{0}{z^2} + \frac{a_1^2}{a_0^2} - \frac{a_2}{a_0}}{a_0}$$

$$= \frac{\frac{a_1^2}{a_0^2}}{\frac{a_0}{1}} - \frac{\frac{a_2}{a_0}}{\frac{a_0}{1}} = \frac{a_1^2}{a_0^3} - \frac{a_2}{a_0^2} = b_2$$

$$b_3 = \frac{(((1-(a2*b0 + a1*b1 + a0*b2)*z^2 - (a1*b0 + a0*b1)*z - (a0*b0)*1)/z^3) - a3*b0 - a2*b1 - a1*b2)}{a0}$$

$$= \frac{(((1-(a2*(1/a0) + a1*(-(a1/a^20)) + a0*((a^21/a^30)-(a2/a^20)))*z^2 - (a1*(1/a0) + a0*(-(a1/a^20)))*z - (a0*(1/a0))*1)/z^3) - a3*(1/a0) - a2*(-(a1/a^20)) - a1*((a^21/a^30)-(a2/a^20)))}{a0}$$

$$= \frac{(((1 - 0 - 0 - 1)/z^3) - (a3/a0) - (a^31/a^30))}{a0}$$

$$b_3 = \frac{\frac{0}{z^3} - \frac{a_3}{a_0} - \frac{a_1^3}{a_0^3}}{a_0} = -\frac{\frac{a_3}{a_0}}{\frac{a_0}{1}} - \frac{\frac{a_1^3}{a_0^3}}{\frac{a_0}{1}} = \frac{a_3}{a_0^2} - \frac{a_1^3}{a_0^4}$$