$n := 4 \cdot N \qquad N := 4$

$$\Delta m := \left[\begin{pmatrix} 0.966 \\ 1.532 \\ -0.024 \end{pmatrix} \begin{pmatrix} -2.548 \\ -1.488 \\ -0.544 \end{pmatrix} \begin{pmatrix} 0.014 \\ -1.309 \\ -2.049 \end{pmatrix} \begin{pmatrix} -1.813 \\ 0.052 \\ 1.034 \end{pmatrix} \begin{pmatrix} -1.622 \\ -0.842 \\ -0.664 \end{pmatrix} \begin{pmatrix} -1.531 \\ -0.137 \\ -0.048 \end{pmatrix} \begin{pmatrix} -0.948 \\ -0.716 \\ 1.41 \end{pmatrix} \begin{pmatrix} 0.202 \\ -1.023 \\ 0.583 \end{pmatrix} \begin{pmatrix} -0.458 \\ 0.173 \\ -0.305 \end{pmatrix} \begin{pmatrix} -0.411 \\ -0.839 \\ -2.087 \end{pmatrix} \begin{pmatrix} -0.384 \\ -1.284 \\ 0.348 \end{pmatrix} \begin{pmatrix} -0.37 \\ 1.575 \\ 1.866 \end{pmatrix} \begin{pmatrix} 0.032 \\ 0.926 \\ 0.608 \end{pmatrix} \begin{pmatrix} 2.421 \\ 0.903 \\ 0.047 \end{pmatrix} \begin{pmatrix} -1.108 \\ 0.057 \\ -1.384 \end{pmatrix} \begin{pmatrix} -0.156 \\ -0.246 \\ -0.202 \end{pmatrix} \right]^T$$

$k := 0, 1 .. n - 1$

$\Delta m_k := \text{rnorm}(3, 0, 1)$

$$M := \frac{1}{n} \cdot \sum_{k=0}^{n-1} \Delta m_k \qquad M = \begin{pmatrix} -0.216 \\ -0.02 \\ 0.081 \end{pmatrix}$$

$k := 0, 1 .. n - 1$

$\Delta m_k := \Delta m_k - M \qquad \alpha_k := k \cdot \frac{2 \cdot \pi}{n} \qquad no_k := \begin{pmatrix} 0 \\ -\sin(2 \cdot \alpha_k) \\ \cos(2 \cdot \alpha_k) \end{pmatrix}$

$$\Delta m^T = \left[\begin{pmatrix} -0.223 \\ -0.659 \\ -0.555 \end{pmatrix} \begin{pmatrix} -0.736 \\ -1.665 \\ -0.038 \end{pmatrix} \begin{pmatrix} 0.095 \\ 0.577 \\ 2.11 \end{pmatrix} \begin{pmatrix} 1.025 \\ 1.005 \\ 0.781 \end{pmatrix} \begin{pmatrix} 1.131 \\ 0.693 \\ -1.126 \end{pmatrix} \begin{pmatrix} 0.285 \\ -0.735 \\ 0.615 \end{pmatrix} \begin{pmatrix} 0.034 \\ -0.624 \\ -0.804 \end{pmatrix} \begin{pmatrix} -0.301 \\ 0.578 \\ -0.326 \end{pmatrix} \begin{pmatrix} 0.305 \\ 1.282 \\ -0.787 \end{pmatrix} \begin{pmatrix} 0.218 \\ 1.128 \\ 0.811 \end{pmatrix} \begin{pmatrix} -2.685 \\ -2.137 \\ 0.125 \end{pmatrix} \begin{pmatrix} -0.4 \\ -1.178 \\ 0.018 \end{pmatrix} \begin{pmatrix} 0.987 \\ 0.326 \\ -0.07 \end{pmatrix} \begin{pmatrix} -0.549 \\ -0.389 \\ -0.755 \end{pmatrix} \begin{pmatrix} 0.084 \\ 1.038 \\ 0.099 \end{pmatrix} \begin{pmatrix} 0.729 \\ 0.76 \\ -0.098 \end{pmatrix} \right]$$

$$C(\Delta m) := \left[\left| \sum_{k=0}^{n-1} \frac{3 \cdot \left(\Delta m_k \cdot no_k \right) \cdot no_k - \Delta m_k}{1} \right| \right]^1$$

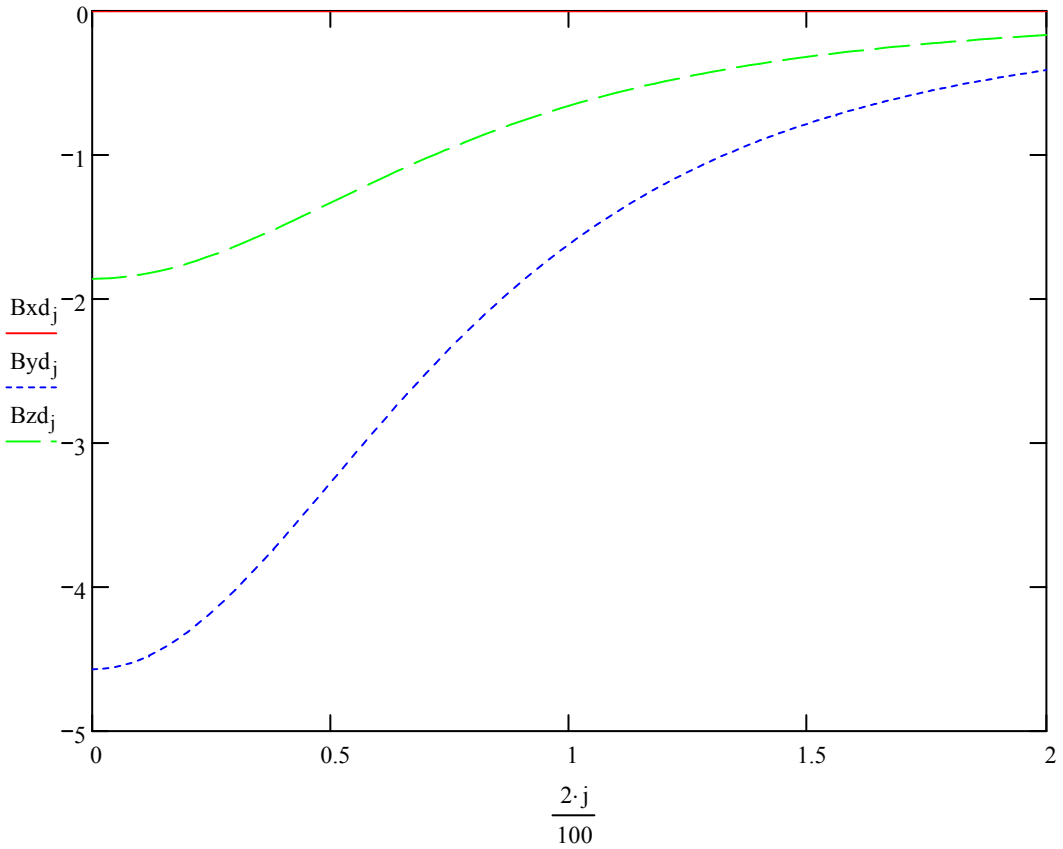
$C(\Delta m) = 4.934$

$Cd := C(\Delta m)$

$$Bx(x) := \left[\sum_{k=0}^{n-1} \frac{3\cdot\left(\Delta m_k \cdot no_k\right)\cdot no_k - \Delta m_k}{\left(1 + x^2\right)^{\frac{3}{2}}}\right]\cdot\begin{pmatrix}1\\0\\0\end{pmatrix} \qquad By(x) := \left[\sum_{k=0}^{n-1} \frac{3\cdot\left(\Delta m_k \cdot no_k\right)\cdot no_k - \Delta m_k}{\left(1 + x^2\right)^{\frac{3}{2}}}\right]\cdot\begin{pmatrix}0\\1\\0\end{pmatrix} \qquad Bz(x) := \left[\sum_{k=0}^{n-1} \frac{3\cdot\left(\Delta m_k \cdot no_k\right)\cdot no_k - \Delta m_k}{\left(1 + x^2\right)^{\frac{3}{2}}}\right]\cdot\begin{pmatrix}0\\0\\1\end{pmatrix}$$

$j := 0, 1 .. 100$

$$Bxd_j := Bx\left(\frac{2\cdot j}{100}\right) \qquad Byd_j := By\left(\frac{2\cdot j}{100}\right) \qquad Bzd_j := Bz\left(\frac{2\cdot j}{100}\right)$$



$a := runif(n, 0, 16)$

$a^T = (11.852 \;\; 9.926 \;\; 12.872 \;\; 9.217 \;\; 14.585 \;\; 11.643 \;\; 10.685 \;\; 5.04 \;\; 4.893 \;\; 1.737 \;\; 13.62 \;\; 2.478 \;\; 1.27 \;\; 10.256 \;\; 8.721 \;\; 6.544)$

$sort(a)^T = (1.27 \;\; 1.737 \;\; 2.478 \;\; 4.893 \;\; 5.04 \;\; 6.544 \;\; 8.721 \;\; 9.217 \;\; 9.926 \;\; 10.256 \;\; 10.685 \;\; 11.643 \;\; 11.852 \;\; 12.872 \;\; 13.62 \;\; 14.585)$

$k := 0, 1 .. n - 1$

$P0_k := k$

$p_k := vergleich\left(sort(a)_k, a\right)_0$

$p^T = (12 \;\; 9 \;\; 11 \;\; 8 \;\; 7 \;\; 15 \;\; 14 \;\; 3 \;\; 1 \;\; 13 \;\; 6 \;\; 5 \;\; 0 \;\; 2 \;\; 10 \;\; 4)$

$zeilen(p) = 16$

$k := 0, 1 .. n - 1$

$\Delta 2m_k := \Delta m_{p_k}$

$n = 16$

$$\Delta 2m^T = \left[\begin{pmatrix}0.987\\0.326\\-0.07\end{pmatrix} \begin{pmatrix}0.218\\1.128\\0.811\end{pmatrix} \begin{pmatrix}-0.4\\-1.178\\0.018\end{pmatrix} \begin{pmatrix}0.305\\1.282\\-0.787\end{pmatrix} \begin{pmatrix}-0.301\\0.578\\-0.326\end{pmatrix} \begin{pmatrix}0.729\\0.76\\-0.098\end{pmatrix} \begin{pmatrix}0.084\\1.038\\0.099\end{pmatrix} \begin{pmatrix}1.025\\1.005\\0.781\end{pmatrix} \begin{pmatrix}-0.736\\-1.665\\-0.038\end{pmatrix} \begin{pmatrix}-0.549\\-0.389\\-0.755\end{pmatrix} \begin{pmatrix}0.034\\-0.624\\-0.804\end{pmatrix} \begin{pmatrix}0.285\\-0.735\\0.615\end{pmatrix} \begin{pmatrix}-0.223\\-0.659\\-0.555\end{pmatrix} \begin{pmatrix}0.095\\0.577\\2.11\end{pmatrix} \begin{pmatrix}-2.685\\-2.137\\0.125\end{pmatrix} \begin{pmatrix}1.131\\0.693\\-1.126\end{pmatrix}\right]$$

$C(\Delta m) = 4.934$ $C(\Delta 2m) = 6.11$

$$\Delta m^T = \left[\begin{pmatrix}-0.223\\-0.659\\-0.555\end{pmatrix} \begin{pmatrix}-0.736\\-1.665\\-0.038\end{pmatrix} \begin{pmatrix}0.095\\0.577\\2.11\end{pmatrix} \begin{pmatrix}1.025\\1.005\\0.781\end{pmatrix} \begin{pmatrix}1.131\\0.693\\-1.126\end{pmatrix} \begin{pmatrix}0.285\\-0.735\\0.615\end{pmatrix} \begin{pmatrix}0.034\\-0.624\\-0.804\end{pmatrix} \begin{pmatrix}-0.301\\0.578\\-0.326\end{pmatrix} \begin{pmatrix}0.305\\1.282\\-0.787\end{pmatrix} \begin{pmatrix}0.218\\1.128\\0.811\end{pmatrix} \begin{pmatrix}-2.685\\-2.137\\0.125\end{pmatrix} \begin{pmatrix}-0.4\\-1.178\\0.018\end{pmatrix} \begin{pmatrix}0.987\\0.326\\-0.07\end{pmatrix} \begin{pmatrix}-0.549\\-0.389\\-0.755\end{pmatrix} \begin{pmatrix}0.084\\1.038\\0.099\end{pmatrix} \begin{pmatrix}0.729\\0.76\\-0.098\end{pmatrix}\right]$$

$$\Delta m := \left| \begin{array}{l} P \leftarrow P0 \\ \text{for } m \in 0..1000 \\ \quad a \leftarrow \text{runif}(n, 0, 16) \\ \quad \text{for } k \in 0..n-1 \\ \quad\quad p_k \leftarrow \text{vergleich}\left(\text{sort}(a)_k, a\right)_0 \\ \quad \text{for } k \in 0..n-1 \\ \quad\quad \Delta 2m_k \leftarrow \Delta m_{p_k} \\ \quad P \leftarrow P0 \text{ if } C(\Delta 2m) < C(\Delta m) \\ \quad \Delta m \leftarrow \Delta 2m \text{ if } C(\Delta 2m) < C(\Delta m) \\ \Delta m \end{array} \right.$$

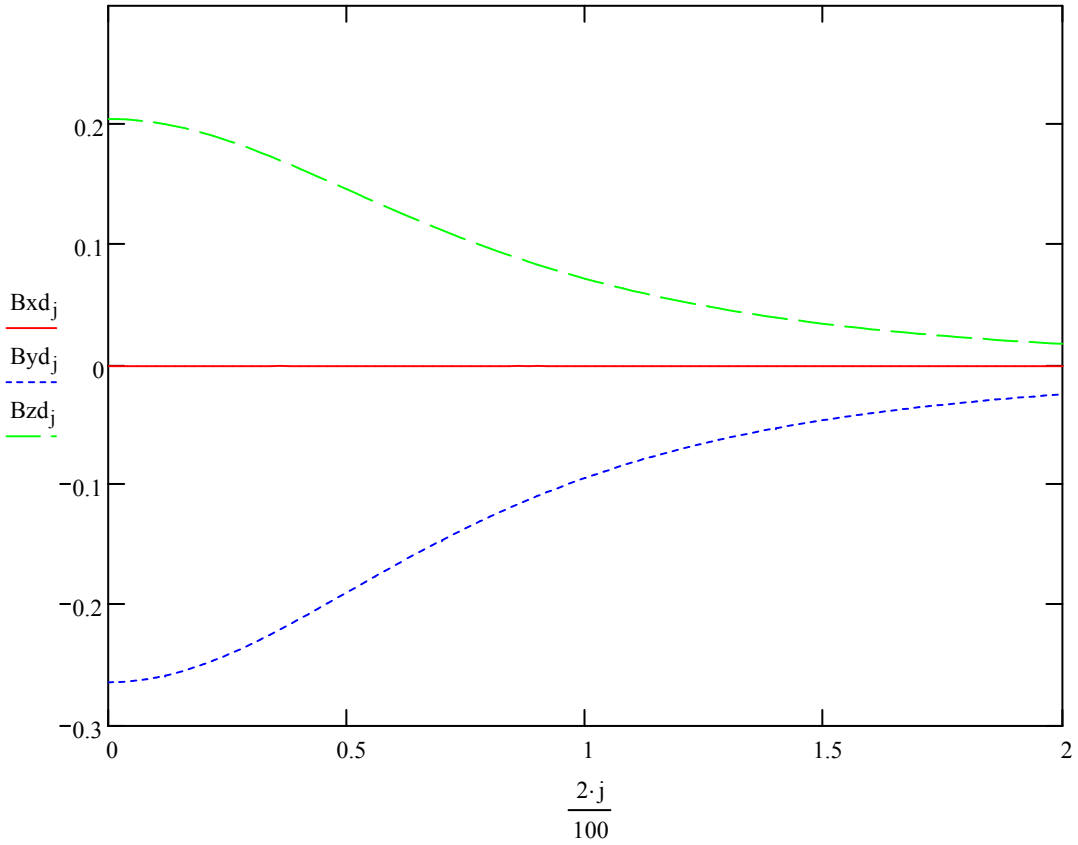
$C(\Delta m) = 0.334$ $\quad$ $C(\Delta 2m) = 6.11$ $\quad$ $\Gamma(n-1) = 8.718 \times 10^{10}$

$$\Delta m^T = \left[\begin{pmatrix} 0.034 \\ -0.624 \\ -0.804 \end{pmatrix} \begin{pmatrix} -2.685 \\ -2.137 \\ 0.125 \end{pmatrix} \begin{pmatrix} 0.084 \\ 1.038 \\ 0.099 \end{pmatrix} \begin{pmatrix} 0.095 \\ 0.577 \\ 2.11 \end{pmatrix} \begin{pmatrix} 0.729 \\ 0.76 \\ -0.098 \end{pmatrix} \begin{pmatrix} 0.285 \\ -0.735 \\ 0.615 \end{pmatrix} \begin{pmatrix} 1.025 \\ 1.005 \\ 0.781 \end{pmatrix} \begin{pmatrix} -0.549 \\ -0.389 \\ -0.755 \end{pmatrix} \begin{pmatrix} -0.4 \\ -1.178 \\ 0.018 \end{pmatrix} \begin{pmatrix} 0.987 \\ 0.326 \\ -0.07 \end{pmatrix} \begin{pmatrix} 1.131 \\ 0.693 \\ -1.126 \end{pmatrix} \begin{pmatrix} -0.301 \\ 0.578 \\ -0.326 \end{pmatrix} \begin{pmatrix} 0.305 \\ 1.282 \\ -0.787 \end{pmatrix} \begin{pmatrix} 0.218 \\ 1.128 \\ 0.811 \end{pmatrix} \begin{pmatrix} -0.736 \\ -1.665 \\ -0.038 \end{pmatrix} \begin{pmatrix} -0.223 \\ -0.659 \\ -0.555 \end{pmatrix} \right]$$

$$Bx(x) := \left[\sum_{k=0}^{n-1} \frac{3 \cdot \left(\Delta m_k \cdot no_k\right) \cdot no_k - \Delta m_k}{\left(1 + x^2\right)^{\frac{3}{2}}} \right] \cdot \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \qquad By(x) := \left[\sum_{k=0}^{n-1} \frac{3 \cdot \left(\Delta m_k \cdot no_k\right) \cdot no_k - \Delta m_k}{\left(1 + x^2\right)^{\frac{3}{2}}} \right] \cdot \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \qquad Bz(x) := \left[\sum_{k=0}^{n-1} \frac{3 \cdot \left(\Delta m_k \cdot no_k\right) \cdot no_k - \Delta m_k}{\left(1 + x^2\right)^{\frac{3}{2}}} \right] \cdot \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$$

$j := 0, 1..100$

$$Bxd_j := Bx\left(\frac{2 \cdot j}{100}\right) \qquad Byd_j := By\left(\frac{2 \cdot j}{100}\right) \qquad Bzd_j := Bz\left(\frac{2 \cdot j}{100}\right)$$



$C(\Delta m) = 0.334$

$\frac{C(\Delta m)}{Cd} = 0.068$