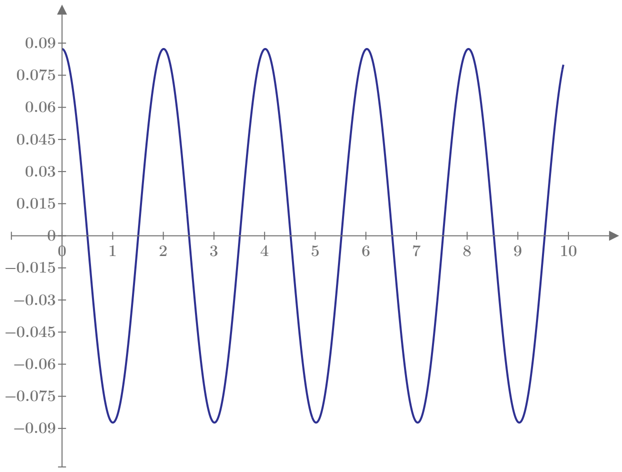
$m := 1$

$l := 1$ $\quad v_0 := 2 \cdot \sqrt{g \cdot l}$ $\quad \varphi_0 := \frac{5}{180} \pi$ $\quad a := l$ $\quad g := 9.80665$ $\quad k := 0.2$ $\quad v_0 := 0$ $\quad y := \begin{bmatrix} v_0 \\ \varphi_0 \end{bmatrix}$ $\quad w_0 := \sqrt{\frac{g}{l}}$

$$D(t, y) := \begin{bmatrix} -w_0{}^2 \cdot y_1 \cdot 1 - 0 \cdot w_0{}^2 \cdot \sin\left(y_1\right) - k \cdot y_0 + a \cdot \sin\left(w_1 \cdot t\right) \\ y_0 \end{bmatrix}$$

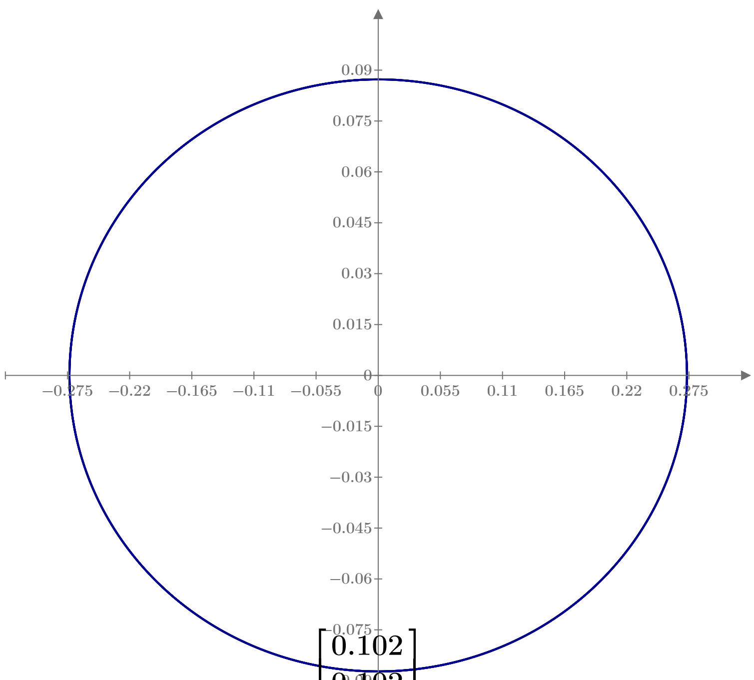
$Z := \mathrm{rkfixed}(y, 0, 9.9, 2000, D)$ $\quad Z =$

$\left(Z^{\langle 2 \rangle}\right)_i$



$\left(Z^{\langle 0 \rangle}\right)_i$

$\left(Z^{\langle 2 \rangle}\right)_i$



$\left(Z^{\langle 1 \rangle}\right)_i$

$\begin{bmatrix} 0.102 \\ 0.102 \\ 0.102 \\ 0.102 \end{bmatrix}$ $\quad \begin{bmatrix} 0 \\ 4.885 \cdot 10^{-4} \\ 9.771 \cdot 10^{-4} \\ 0.001 \end{bmatrix}$

$$A:=\frac{1}{\sqrt{\left(w_0^{\,2}-w^2\right)^2+4\left(\delta^2\cdot w^2\right)}}=\begin{bmatrix}0.102\\0.102\\0.102\\0.102\\0.102\\0.102\\0.103\\0.103\\\vdots\end{bmatrix}$$

$$\varphi:=\operatorname{atan}\left(\frac{2\cdot\delta\cdot w}{w_0^{\,2}-w^2}\right)=\begin{bmatrix}0.002\\0.002\\0.003\\0.003\\0.004\\0.004\\0.005\\0.005\\\vdots\end{bmatrix}$$

$$g:=9.80665$$

$$v_0:=2\cdot\sqrt{g\cdot l}\qquad \varphi_0:=0\qquad a:=l\qquad k:=0.2\qquad v_0:=\frac{\pi}{2}\qquad y:=\begin{bmatrix}v_0\\\varphi_0\end{bmatrix}\qquad w_0:=\sqrt{\frac{g}{l}}$$

$$\left\|\begin{array}{l} w0\leftarrow\sqrt{\dfrac{g}{l}}\\ h\leftarrow 0.025\\ d\leftarrow 0.1\\ w\leftarrow w0\cdot 0.1\\ v\leftarrow\dfrac{\pi}{24}\\ phi\leftarrow 0\\ i\leftarrow 0\\ m\leftarrow l\cdot\sin(phi)\\ \text{while } i<n\\ \quad\left\|\begin{array}{l} t\leftarrow h\cdot\left(a\cdot\sin(w\cdot i\cdot h)-w0^2\cdot\sin(phi)\right)\\ phi\leftarrow phi+h\cdot v\\ v\leftarrow v+t\\ i\leftarrow i+1\\ \text{if } (l\cdot\sin(phi)>m)\\ \quad\left\| m\leftarrow l\cdot\sin(phi)\right.\end{array}\right.\\ m\end{array}\right.=1$$

$$R(t,y):=\begin{bmatrix}\dfrac{-g}{l}\cdot y_1\cdot 0-1\cdot w_0\cdot\sin\left(y_1\right)-k\cdot y_0+a\cdot\sin\left(w\right.\\ y_0\end{bmatrix}$$

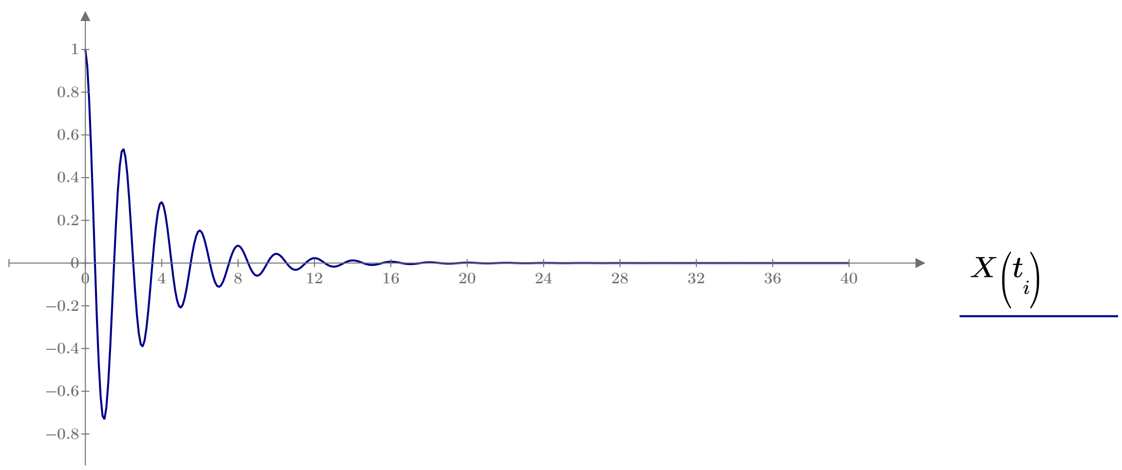
$$\left(A^{\langle i\rangle}\right)_j:=\frac{A0}{m\cdot\sqrt{\left(w0^2-w_j^{\,2}\right)^2+4\;b_i^{\,2}\cdot w_j^{\,2}}}$$

$$t:=0,0.1\,..\,40=\begin{bmatrix}0\\\vdots\end{bmatrix}$$

$$m:=1$$
$$l:=1$$

$$d:=0.1\qquad w0:=\sqrt{\frac{g}{l}}\qquad w:=w0\qquad f:=0$$

$$A0:=l\qquad b:=d\cdot w0\qquad X(t):=A0\cdot e^{-b\cdot t}\cdot\cos(w\cdot t+f)$$



t_i

$n := 1000$

$m := 3 \qquad step := \frac{m}{n}$

$k := 0, step..m = \begin{bmatrix} 0 \\ 0.003 \\ 0.006 \\ \vdots \end{bmatrix}$

$z(t) := 3 \cdot \frac{t}{m} \qquad z(k) = \begin{bmatrix} 0 \\ 0.003 \\ 0.006 \\ \vdots \end{bmatrix}$

$w := w0 \cdot k = \begin{bmatrix} 0 \\ 0.009 \\ 0.019 \\ \vdots \end{bmatrix}$

$d := 0, 0.01..10 = \begin{bmatrix} 0 \\ \vdots \end{bmatrix}$

$b := w0 \cdot d$

$$A_1 := \left\| \begin{array}{l} j \leftarrow 0 \\ \text{while } j \le n \\ \quad \left\| \begin{array}{l} (A)_j \leftarrow \dfrac{A0}{m \cdot \sqrt{\left(w0^2 - {w_j}^2\right)^2 + 4\, {b_{30}}^2 \cdot {w_j}^2}} \\ j \leftarrow j+1 \end{array} \right. \\ A \end{array} \right.$$

$$A_2 := \left\| \begin{array}{l} j \leftarrow 0 \\ \text{while } j \le n \\ \quad \left\| \begin{array}{l} (A)_j \leftarrow \dfrac{A0}{m \cdot \sqrt{\left(w0^2 - {w_j}^2\right)^2 + 4\, {b_{30}}^2 \cdot {w_j}^2}} \\ j \leftarrow j+1 \end{array} \right. \\ A \end{array} \right.$$

$$A_5 := \left\| \begin{array}{l} j \leftarrow 0 \\ \text{while } j \le n \\ \quad \left\| \begin{array}{l} (A)_j \leftarrow \dfrac{A0}{m \cdot \sqrt{\left(w0^2 - {w_j}^2\right)^2 + 4\, {b_{15}}^2 \cdot {w_j}^2}} \\ j \leftarrow j+1 \end{array} \right. \\ A \end{array} \right.$$

$$A_6 := \left\| \begin{array}{l} j \leftarrow 0 \\ \text{while } j \le n \\ \quad \left\| \begin{array}{l} (A)_j \leftarrow \dfrac{A0}{m \cdot \sqrt{\left(w0^2 - {w_j}^2\right)^2 + 4\, {b_{20}}^2 \cdot {w_j}^2}} \\ j \leftarrow j+1 \end{array} \right. \\ A \end{array} \right.$$

$$A_9 := \left\| \begin{array}{l} j \leftarrow 0 \\ \text{while } j \le n \\ \quad \left\| \begin{array}{l} (A)_j \leftarrow \dfrac{A0}{m \cdot \sqrt{\left(w0^2 - {w_j}^2\right)^2 + 4\, {b_{50}}^2 \cdot {w_j}^2}} \\ j \leftarrow j+1 \end{array} \right. \end{array} \right.$$

$$A_{10} := \left\| \begin{array}{l} j \leftarrow 0 \\ \text{while } j \le n \\ \quad \left\| \begin{array}{l} (A)_j \leftarrow \dfrac{A0}{m \cdot \sqrt{\left(w0^2 - {w_j}^2\right)^2 + 4\, {b_{100}}^2 \cdot {w_j}^2}} \\ j \leftarrow j+1 \end{array} \right. \end{array} \right.$$

$\| j \leftarrow j+1$
$\| A$

$\| j \leftarrow j+1$
$\| A$