

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

$v_0 := 2 \cdot \sqrt{g \cdot l}$

$\varphi_0 := \frac{20}{180} \, \pi$

$a := l$

$g := 9.80665$
 $k := 0.2$

$v_0 := 0$

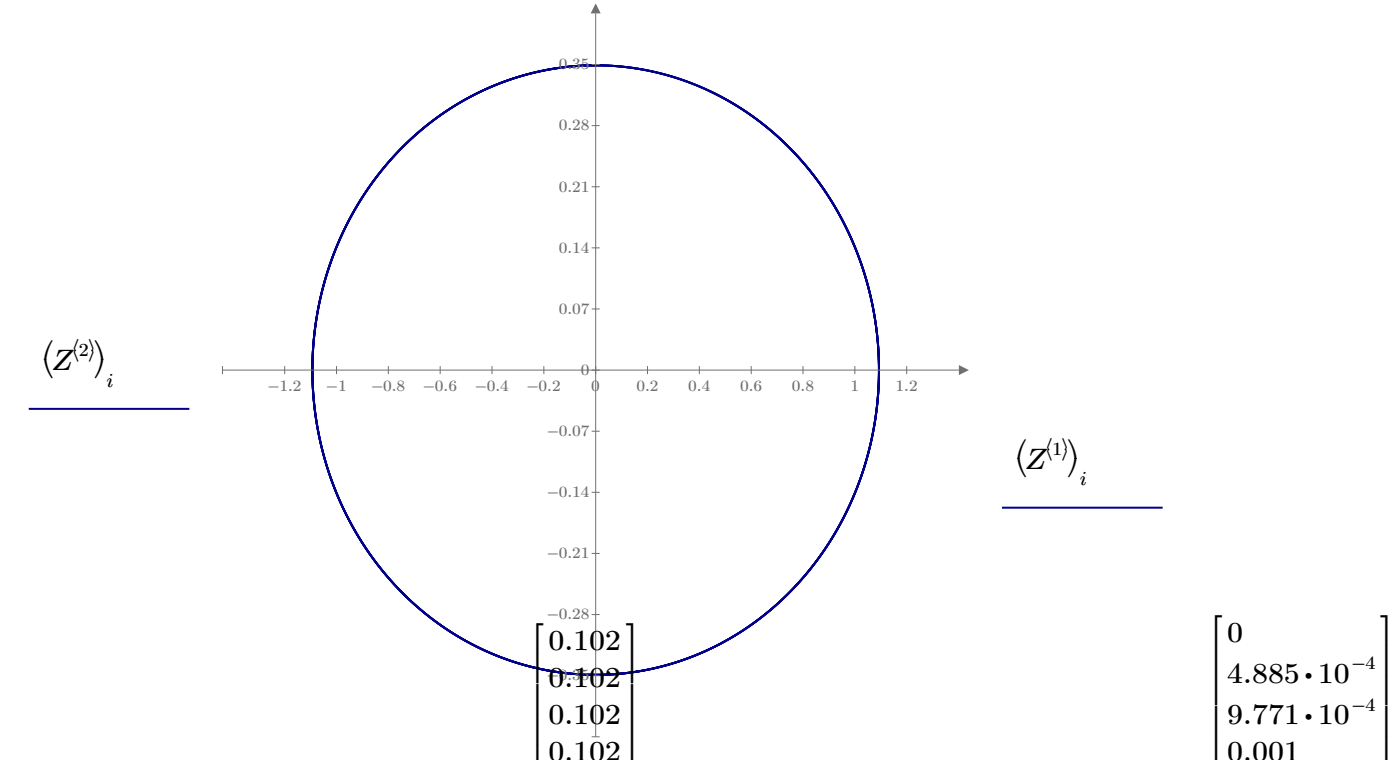
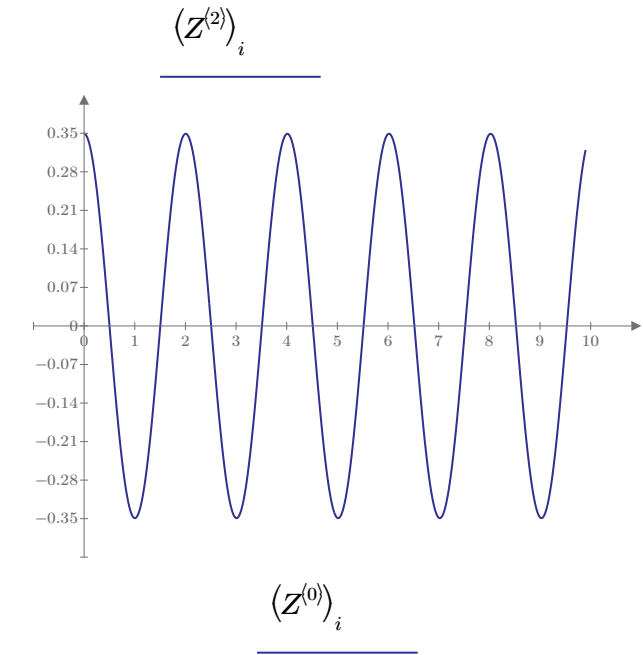
$y := \begin{bmatrix} v_0 \\ \varphi_0 \end{bmatrix}$

$w_0 := \sqrt{\frac{g}{l}}$

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

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

$Z =$



$$A:=\frac{1}{\sqrt{\left(w_0^2-w^2\right)^2+4\left(\delta^2\cdot w^2\right)}}=\begin{bmatrix}0.102\\0.102\\0.102\\0.102\\0.102\\0.102\\0.103\\0.103\\ \vdots\end{bmatrix}\qquad \varphi:=\operatorname{atan}\left(\frac{2\cdot\delta\cdot w}{w_0^2-w^2}\right)=\begin{bmatrix}0.002\\0.002\\0.003\\0.003\\0.004\\0.004\\0.005\\0.005\\ \vdots\end{bmatrix}$$

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

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

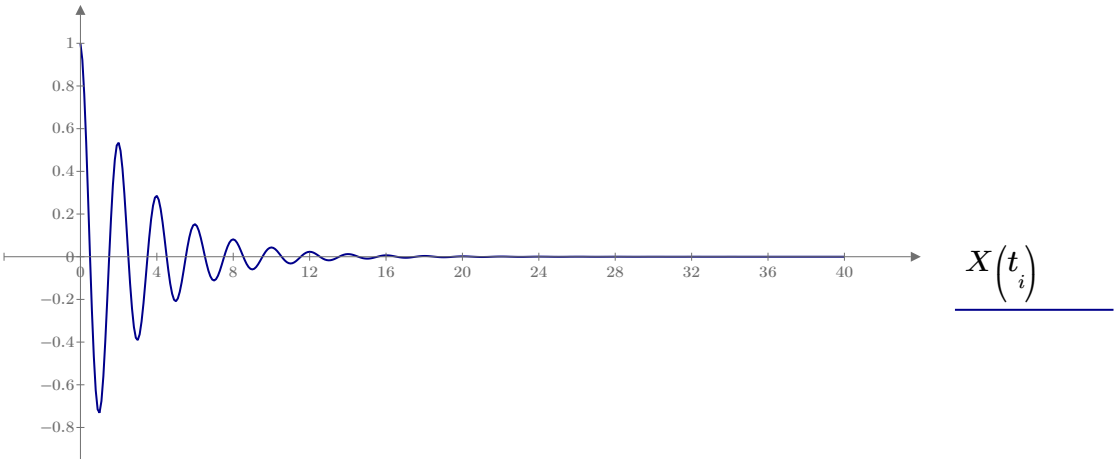
$$R(t,y):=\begin{bmatrix} \frac{-g}{l}\cdot y_1\cdot 0-1\cdot w_0\cdot \sin\left(y_1\right)-k\cdot y_0+a\cdot \sin\left(w\cdot t\right) \\ y_0 \end{bmatrix}$$

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

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

$$d:=0.1\qquad w0:=\sqrt{\frac{g}{l}}\qquad w:=w0\qquad f:=0\qquad m:=1\qquad l:=1$$

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



$$\underline{t_i}$$

$$\boxed{n}:=1000$$

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

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

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

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

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

$$\boxed{b}:=w0\cdot d$$

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

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

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

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

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

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

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