$$\omega_1 = \frac{\partial^2}{\partial t^2}\left(\xi(t) - \frac{\epsilon\,\frac{d^2}{dt^2}\xi(t)}{\sqrt{\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}}\right) \tag{1}$$

$$\omega_2 = \frac{\partial^2}{\partial t^2}\left(\zeta(t) - \frac{\epsilon\left(\frac{d^2}{dt^2}\zeta(t)+1\right)}{\sqrt{\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}}\right) \tag{2}$$

$$\begin{aligned}
\omega_1 &= \frac{d^2}{dt^2}\xi(t) - \frac{\epsilon\,\frac{d^4}{dt^4}\xi(t)}{\sqrt{\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}} + \frac{\epsilon\left(\frac{d^3}{dt^3}\xi(t)\right)\left(2\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t) + 2\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}} - \\
&- 3/4\,\frac{\epsilon\left(\frac{d^2}{dt^2}\xi(t)\right)\left(2\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t) + 2\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{5/2}} + \\
&+ 1/2\,\frac{\epsilon\left(\frac{d^2}{dt^2}\xi(t)\right)\left(2\left(\frac{d^3}{dt^3}\xi(t)\right)^2 + 2\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^4}{dt^4}\xi(t) + 2\left(\frac{d^3}{dt^3}\zeta(t)\right)^2 + 2\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^4}{dt^4}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}
\end{aligned} \tag{3}$$

$$\begin{aligned}
\omega_2 &= \frac{d^2}{dt^2}\zeta(t) - \frac{\epsilon\,\frac{d^4}{dt^4}\zeta(t)}{\sqrt{\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}} + \frac{\epsilon\left(\frac{d^3}{dt^3}\zeta(t)\right)\left(2\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t) + 2\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}} - \\
&- 3/4\,\frac{\epsilon\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\left(2\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t) + 2\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{5/2}} + \\
&+ 1/2\,\frac{\epsilon\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\left(2\left(\frac{d^3}{dt^3}\xi(t)\right)^2 + 2\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^4}{dt^4}\xi(t) + 2\left(\frac{d^3}{dt^3}\zeta(t)\right)^2 + 2\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^4}{dt^4}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2 + \left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}
\end{aligned} \tag{4}$$

$$
\begin{aligned}
\frac{d^4}{dt^4}\xi(t)\frac{\epsilon\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}} &= \omega_1-\frac{d^2}{dt^2}\xi(t)-\frac{\epsilon\,\left(\frac{d^3}{dt^3}\xi(t)\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}+\\
&+ 3/4\,\frac{\epsilon\,\left(\frac{d^2}{dt^2}\xi(t)\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{5/2}}-\\
&- 1/2\,\frac{\epsilon\,\left(\frac{d^2}{dt^2}\xi(t)\right)\left(2\,\left(\frac{d^3}{dt^3}\xi(t)\right)^2+2\,\left(\frac{d^3}{dt^3}\zeta(t)\right)^2+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^4}{dt^4}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}} \qquad (5)
\end{aligned}
$$

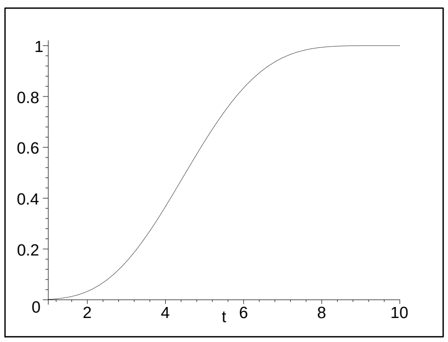
$$
\begin{aligned}
\frac{d^4}{dt^4}\xi(t)\frac{\epsilon\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}} &= \frac{1}{\left(\frac{d^2}{dt^2}\xi(t)\right)}\left[\omega_2-\frac{d^2}{dt^2}\zeta(t)+\frac{\epsilon\,\frac{d^4}{dt^4}\zeta(t)}{\sqrt{\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}}-\right.\\
&- \frac{\epsilon\,\left(\frac{d^3}{dt^3}\zeta(t)\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}+\\
&+ 3/4\,\frac{\epsilon\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{5/2}}-\\
&- \left.\frac{\epsilon\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\left(\left(\frac{d^3}{dt^3}\xi(t)\right)^2+\left(\frac{d^3}{dt^3}\zeta(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^4}{dt^4}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}\right] \qquad (6)
\end{aligned}
$$

$$
\begin{aligned}
\frac{d^4}{dt^4}\xi(t)\,\frac{\epsilon\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}} &= \omega_1-\frac{d^2}{dt^2}\xi(t)-\frac{\epsilon\,\left(\frac{d^3}{dt^3}\xi(t)\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}+\\
&+\ 3/4\,\frac{\epsilon\,\left(\frac{d^2}{dt^2}\xi(t)\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{5/2}}-\\
&-\ 1/2\,\frac{\epsilon\,\left(\frac{d^2}{dt^2}\xi(t)\right)\left(2\,\left(\frac{d^3}{dt^3}\xi(t)\right)^2+2\,\left(\frac{d^3}{dt^3}\zeta(t)\right)^2+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^4}{dt^4}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}
\end{aligned}
\tag{7}
$$

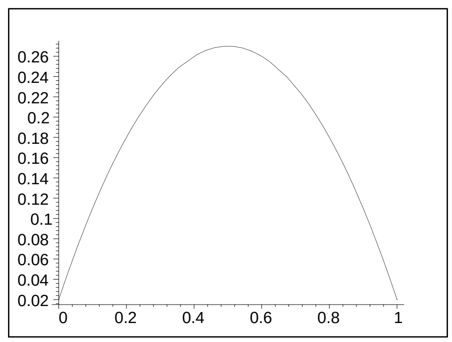
$$
\begin{aligned}
\frac{d^4}{dt^4}\zeta(t)\,\frac{-\epsilon\,\frac{d^2}{dt^2}\xi(t)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}} &= \omega_2-\frac{d^2}{dt^2}\zeta(t)-\frac{\epsilon\,\left(\frac{d^3}{dt^3}\zeta(t)\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}+\\
&+\ 3/4\,\frac{\epsilon\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\left(2\,\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^3}{dt^3}\xi(t)+2\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\frac{d^3}{dt^3}\zeta(t)\right)^2}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{5/2}}-\\
&-\ \frac{\epsilon\,\left(\frac{d^2}{dt^2}\zeta(t)+1\right)\left(\left(\frac{d^3}{dt^3}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\xi(t)\right)\frac{d^4}{dt^4}\xi(t)+\left(\frac{d^3}{dt^3}\zeta(t)\right)^2\right)}{\left(\left(\frac{d^2}{dt^2}\xi(t)\right)^2+\left(\frac{d^2}{dt^2}\zeta(t)+1\right)^2\right)^{3/2}}
\end{aligned}
\tag{8}
$$

$$
\begin{aligned}
\xi(t) &= r_1\left(\frac{t-T_1}{t_2-T_1}\right)^5 - r_2\left(\frac{t-T_1}{t_2-T_1}\right)^6 + r_3\left(\frac{t-T_1}{t_2-T_1}\right)^7 - r_4\left(\frac{t-T_1}{t_2-T_1}\right)^8 + r_5\left(\frac{t-T_1}{t_2-T_1}\right)^9 - r_6\left(\frac{t-T_1}{t_2-T_1}\right)^{10}\\
\xi(t) &= \frac{63}{25000}\,t^5 - \frac{21}{20000}\,t^6 + \frac{9}{50000}\,t^7 - \frac{63}{4000000}\,t^8 + \frac{7}{10000000}\,t^9 - \frac{63}{5000000000}\,t^{10}
\end{aligned}
$$

$$
\begin{aligned}
\zeta(t) &= \frac{D^2}{4} + \epsilon - \left(\xi(t) - \frac{D}{2}\right)^2\\
\zeta(t) &= 0.270 - \left(\frac{63}{25000}\,t^5 - \frac{21}{20000}\,t^6 + \frac{9}{50000}\,t^7 - \frac{63}{4000000}\,t^8 + \frac{7}{10000000}\,t^9 - \frac{63}{5000000000}\,t^{10} - 1/2\right)^2
\end{aligned}
$$




*Entrada.*




*Trayectoria*

$$
\begin{aligned}
\xi(t) &= -\frac{63}{5000000000}\,t^{10} + \frac{7}{10000000}\,t^{9} - \frac{63}{4000000}\,t^{8} + \frac{9}{50000}\,t^{7} - \frac{21}{20000}\,t^{6} + \frac{63}{25000}\,t^{5} \\
\frac{d}{dt}\xi(t) &= -\frac{63}{500000000}\,t^{9} + \frac{63}{10000000}\,t^{8} - \frac{63}{500000}\,t^{7} + \frac{63}{50000}\,t^{6} - \frac{63}{10000}\,t^{5} + \frac{63}{5000}\,t^{4} \\
\frac{d^2}{dt^2}\xi(t) &= -\frac{567}{500000000}\,t^{8} + \frac{63}{1250000}\,t^{7} - \frac{441}{500000}\,t^{6} + \frac{189}{25000}\,t^{5} - \frac{63}{2000}\,t^{4} + \frac{63}{1250}\,t^{3} \\
\frac{d^3}{dt^3}\xi(t) &= -\frac{567}{62500000}\,t^{7} + \frac{441}{1250000}\,t^{6} - \frac{1323}{250000}\,t^{5} + \frac{189}{5000}\,t^{4} - \frac{63}{500}\,t^{3} + \frac{189}{1250}\,t^{2} \\
\frac{d^4}{dt^4}\xi(t) &= -\frac{3969}{62500000}\,t^{6} + \frac{1323}{625000}\,t^{5} - \frac{1323}{50000}\,t^{4} + \frac{189}{1250}\,t^{3} - \frac{189}{500}\,t^{2} + \frac{189}{625}\,t
\end{aligned} \tag{9}
$$

$$
\begin{aligned}
\zeta(t) &= 0.270 - \left(-\frac{63}{5E09}\,t^{10} + \frac{7}{10E06}\,t^{9} - \frac{63}{4E06}\,t^{8} + \frac{9}{50E03}\,t^{7} - \frac{21}{20E03}\,t^{6} + \frac{63}{25000}\,t^{5} - 1/2\right)^2 \\
\frac{d}{dt}\zeta(t) &= -\frac{3969}{1250E15}\,t^{19} + \frac{8379}{25E15}\,t^{18} - \frac{79821}{5E15}\,t^{17} + \frac{225981}{500E12}\,t^{16} - \frac{210609}{25E12}\,t^{15} + \frac{1350657}{12500E09}\,t^{14} - \frac{483021}{500E09}\,t^{13} + \frac{297297}{50E09}\,t^{12} - \\
&- \frac{60291}{2500E06}\,t^{11} + \frac{14553}{250E06}\,t^{10} - \frac{6363}{100E06}\,t^{9} + \frac{63}{10E06}\,t^{8} - \frac{63}{500E03}\,t^{7} + \frac{63}{50E03}\,t^{6} - \frac{63}{10E03}\,t^{5} + \frac{63}{5E03}\,t^{4} \\
\frac{d^2}{dt^2}\zeta(t) &= -\frac{75411}{1.25E18}\,t^{18} + \frac{75411}{12.5E15}\,t^{17} - \frac{1356957}{5E15}\,t^{16} + \frac{225981}{31.25E12}\,t^{15} - \frac{631827}{5E12}\,t^{14} + \frac{9454599}{6.25E12}\,t^{13} - \frac{6279273}{0.5E12}\,t^{12} + \frac{891891}{12.5E09}\,t^{11} - \\
&- \frac{663201}{2.5E09}\,t^{10} + \frac{14553}{25E06}\,t^{9} - \frac{57267}{0.1E09}\,t^{8} + \frac{63}{1250000}\,t^{7} - \frac{441}{0.5E06}\,t^{6} + \frac{189}{25E03}\,t^{5} - \frac{63}{2E03}\,t^{4} + \frac{63}{1250}\,t^{3} \\
\frac{d^3}{dt^3}\zeta(t) &= -\frac{678699}{625E15}\,t^{17} + \frac{1281987}{12.5E15}\,t^{16} - \frac{1356957}{312.5E12}\,t^{15} + \frac{677943}{6.25E12}\,t^{14} - \frac{4422789}{2.5E12}\,t^{13} + \frac{122909787}{6.25E12}\,t^{12} - \frac{18837819}{125E09}\,t^{11} + \frac{9810801}{12.5E09}\,t^{10} - \\
&- \frac{663201}{250E06}\,t^{9} + \frac{130977}{25E06}\,t^{8} - \frac{57267}{12.5E06}\,t^{7} + \frac{441}{1.25E06}\,t^{6} - \frac{1323}{250E03}\,t^{5} + \frac{189}{5E03}\,t^{4} - \frac{63}{500}\,t^{3} + \frac{189}{1250}\,t^{2} \\
\frac{d^4}{dt^4}\zeta(t) &= -\frac{11537883}{625E15}\,t^{16} + \frac{1281987}{781.25E12}\,t^{15} - \frac{4070871}{62.5E12}\,t^{14} + \frac{4745601}{3125E09}\,t^{13} - \frac{57496257}{2.5E09}\,t^{12} + \frac{368729361}{1562.5E09}\,t^{11} - \frac{207216009}{125E09}\,t^{10} + \\
&+ \frac{9810801}{1.25E09}\,t^{9} - \frac{5968809}{250E06}\,t^{8} + \frac{130977}{3.125E06}\,t^{7} - \frac{400869}{12.5E06}\,t^{6} + \frac{1323}{625E03}\,t^{5} - \frac{1323}{50E03}\,t^{4} + \frac{189}{1250}\,t^{3} - \frac{189}{500}\,t^{2} + \frac{189}{625}\,t
\end{aligned} \tag{10}
$$