Original

$$z = (2i + (l-1))\frac{L}{2q}$$

Where: $z = f * \frac{L}{2q}$

Second Order

$$f = C_0 + C_1(2i+l) + C_2(2i+l)^2$$

<u>i = 0 l = 1 f = 0</u>

$$f = 0 = C_0 + C_1 + C_2$$

<u>i = q l = 1 f = 2q</u>

$$f = 2q = C_0 + C_1(2q+1) + C_2(2q+1)^2$$

Linearizing this matrix to isolate C_2 leads to:

$$\begin{bmatrix} 1 & 1 \\ 1 & 2q+1 \end{bmatrix} \begin{bmatrix} C_0 \\ C_1 \end{bmatrix} = \begin{bmatrix} 0 - C_2 \\ 2q - C_2(2q+1)^2 \end{bmatrix}$$

Solving in Matlab:

```
syms q C_2
A = [1 1 ;
     1 (2*q+1)]
```

A =

$$\begin{pmatrix} 1 & 1 \\ 1 & 2\,q+1 \end{pmatrix}$$

```
 B = [0 - C_2 ;
      2*q - C_2*(2*q+1)^2]
```

B =

$$\begin{pmatrix} -C_2 \\ 2\,q - C_2\,(2\,q+1)^2 \end{pmatrix}$$

```
  x = linsolve(A,B)
```

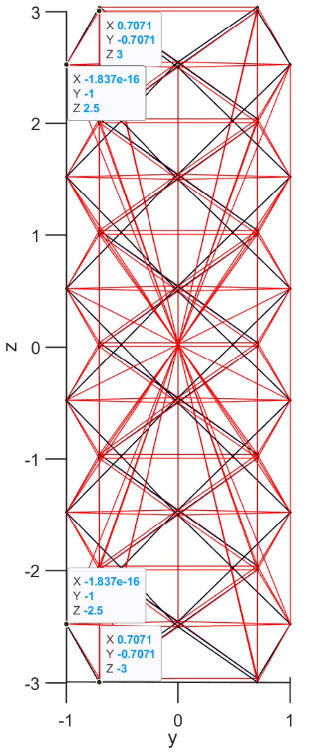
x =

$$\begin{pmatrix} C_2 + 2\,C_2\,q - 1 \\ 1 - 2\,C_2\,q - 2\,C_2 \end{pmatrix}$$

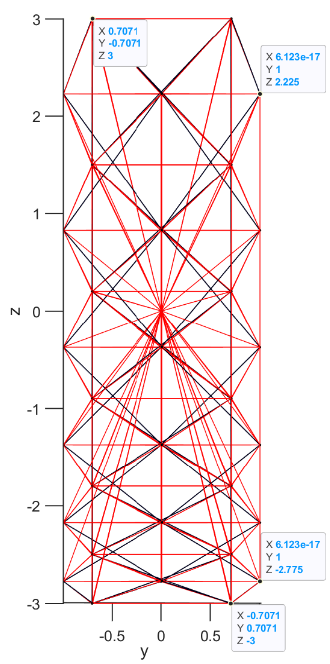
Plug in C_0 and C_1 into *f*

$$f = C_2 + 2C_2 q - 1 + (2i + l)(1 - 2C_2 q - 2C_2) + (2i + l)^2 C_2$$

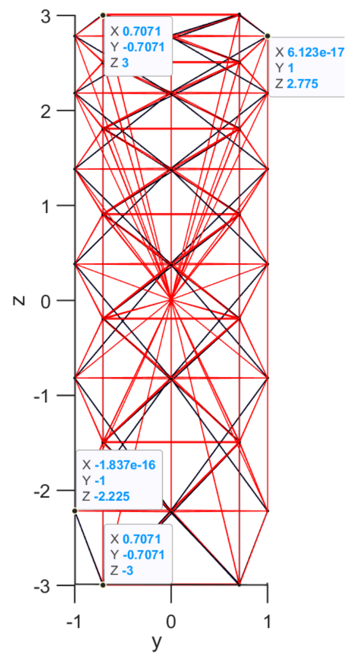
Output



$C_2 = 0$



$C_2 = 0.05$



$C_2 = -0.05$

Third Order

$$f = C_0 + C_1(2i+l) + C_2(2i+l)^2 + C_3(2i+l)^3$$

i = 0   l = 1   f = 0

$$f = 0 = C_0 + C_1 + C_2 + C_3$$

i = q   l = 1   f = 2q

$$f = 2q = C_0 + C_1(2q+1) + C_2(2q+1)^2 + C_3(2q+1)^3$$

Linearizing this matrix to isolate C_3 leads to:

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2q+l & (2q+1)^2 \end{bmatrix} \begin{bmatrix} C_0 \\ C_1 \\ C_2 \end{bmatrix} = \begin{bmatrix} -C_3 \\ 2q - C_3(2q+1)^3 \end{bmatrix}$$

For symmetry, we can set $C_2 = 0$

$$\begin{bmatrix} 1 & 1 & 0 \\ 1 & 2q+1 & 0 \end{bmatrix} \begin{bmatrix} C_0 \\ C_1 \\ C_2 \end{bmatrix} = \begin{bmatrix} -C_3 \\ 2q - C_3(2q+1)^3 \end{bmatrix}$$

Solving in Matlab:

```
clear;
  syms C_3 q
  A = [1 1 1;
     1 (2*q+1) (2*q+1)^2]
```

A =

$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2\,q+1 & (2\,q+1)^2 \end{pmatrix}$$

```
 B = [-C_3;
      2*q - C_3*(2*q + 1)^3]
```

B =

$$\begin{pmatrix} -C_3 \\ 2\,q - C_3\,(2\,q+1)^3 \end{pmatrix}$$

```
  x = linsolve(A,B)
```

Warning: Solution is not unique because the system is rank-deficient.

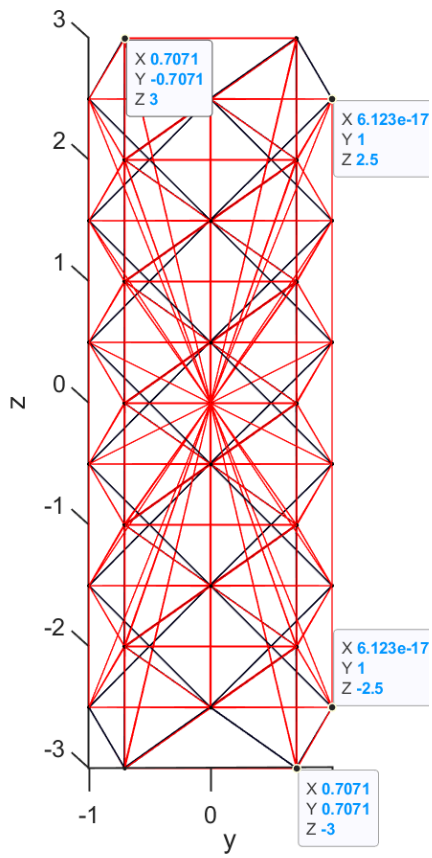
x =

$$\begin{pmatrix} 4\,C_3\,q^2+6\,C_3\,q+2\,C_3-1 \\ -4\,C_3\,q^2-6\,C_3\,q-3\,C_3+1 \\ 0 \end{pmatrix}$$

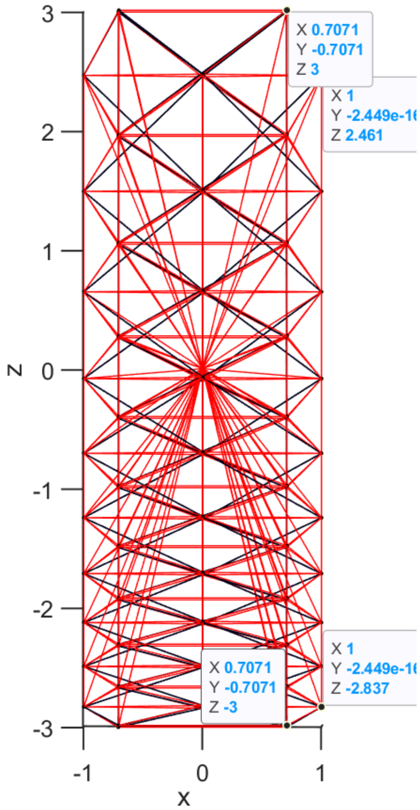
Plug in C_0 and C_1 into *f*

$$f\ = C_0\ + C_1(2i+l)+C_2(2i+l)^2+C_3(2i+l)^3$$

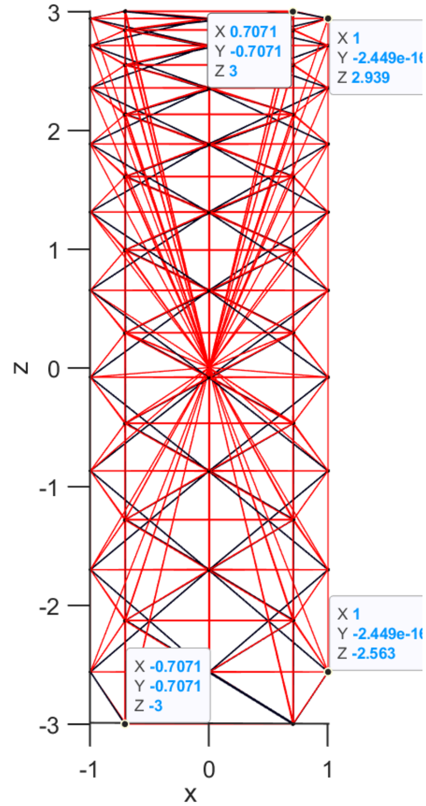
$$f\ =\ 4C_3q^2+6C_3q+2C_3-1+\left(-4C_3q^2-6C_3q-3C_3+1\right)(2i+l)+C_3(2i+l)^3$$



$C_3 = 0$



$C_3 = 0.01$



$C_3 = -0.01$

what in the world.