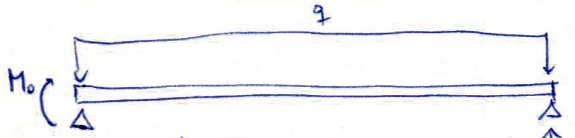
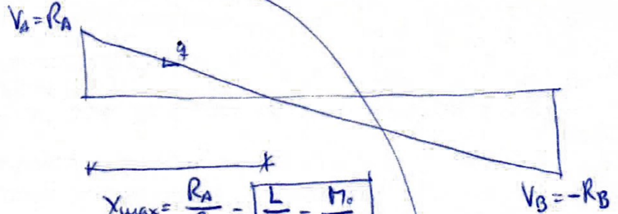
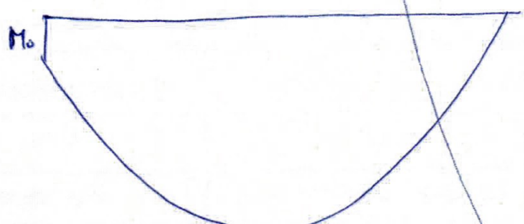



$R_A = \frac{qL}{2} - \frac{M_0}{L}$ $\qquad$ $R_B = \frac{qL}{2} + \frac{M_0}{L}$




$$x_{max} = \frac{R_A}{q} = \boxed{\frac{L}{2} - \frac{M_0}{qL}}$$

$$M(x) = M_0 + R_A x - \frac{qx^2}{2} = -\frac{q}{2}x^2 + R_A x + M_0$$




$$x_G = \frac{\int_0^L M(x)\cdot x\,dx}{\int_0^L M(x)} = \frac{\int_0^L \left(-\frac{q}{2}x^3 + R_A x^2 + M_0 x\right)dx}{\int_0^L \left(-\frac{q}{2}x^2 + R_A x + M_0\right)dx} = \frac{\left[-\frac{q}{8}x^4 + \frac{R_A}{3}x^3 + \frac{M_0}{2}x^2\right]_0^L}{\left[-\frac{q}{6}x^3 + \frac{R_A}{2}x^2 + M_0 x\right]_0^L} =$$

$$= \frac{-\frac{qL^4}{8} + \frac{R_A L^3}{3} + \frac{M_0 L^2}{2}}{-\frac{qL^3}{6} + \frac{R_A L^2}{2} + M_0 L} = \frac{-\frac{qL^3}{8} + \frac{R_A L^2}{3} + \frac{M_0 L}{2}}{-\frac{qL^2}{6} + \frac{R_A L}{2} + M_0} = \frac{-\frac{qL^3}{8} + \frac{L^2}{3}\left(\frac{qL}{2} - \frac{M_0}{L}\right) + \frac{M_0 L}{2}}{-\frac{qL^2}{6} + \frac{L}{2}\left(\frac{qL}{2} - \frac{M_0}{L}\right) + M_0} =$$

$$= \frac{-\frac{qL^3}{8} + \frac{qL^3}{6} - \frac{M_0 L}{3} + \frac{M_0 L}{2}}{-\frac{qL^2}{6} + \frac{qL^2}{4} - \frac{M_0}{2} + M_0} = \frac{qL^3\left(\frac{1}{6} - \frac{1}{8}\right) + M_0 L\left(\frac{1}{2} - \frac{1}{3}\right)}{qL^2\left(\frac{1}{4} - \frac{1}{6}\right) + M_0\left(1 - \frac{1}{2}\right)} = \frac{qL^3\,\frac{4-3}{24} + M_0 L\,\frac{3-2}{6}}{qL^2\,\frac{3-2}{12} + M_0\,\frac{2-1}{2}} =$$

$$= \frac{\frac{qL^3}{24} + \frac{M_0 L}{6}}{\frac{qL^2}{12} + \frac{M_0}{2}} = \frac{\frac{qL^3 + 4M_0 L}{24}}{\frac{2qL^2 + 12M_0}{24}} = \boxed{\frac{qL^3 + 4M_0 L}{2qL^2 + 12M_0}}$$

2 funciones de 3 variables que no sabemos si son iguales

$$\left\{\begin{aligned} f_1 &= x_{max}(L, q, M_0) = \frac{L}{2} - \frac{M_0}{qL} \\ f_2 &= x_G(L, q, M_0) = \frac{qL^3 + 4M_0 L}{2qL^2 + 12M_0} \end{aligned}\right\}$$

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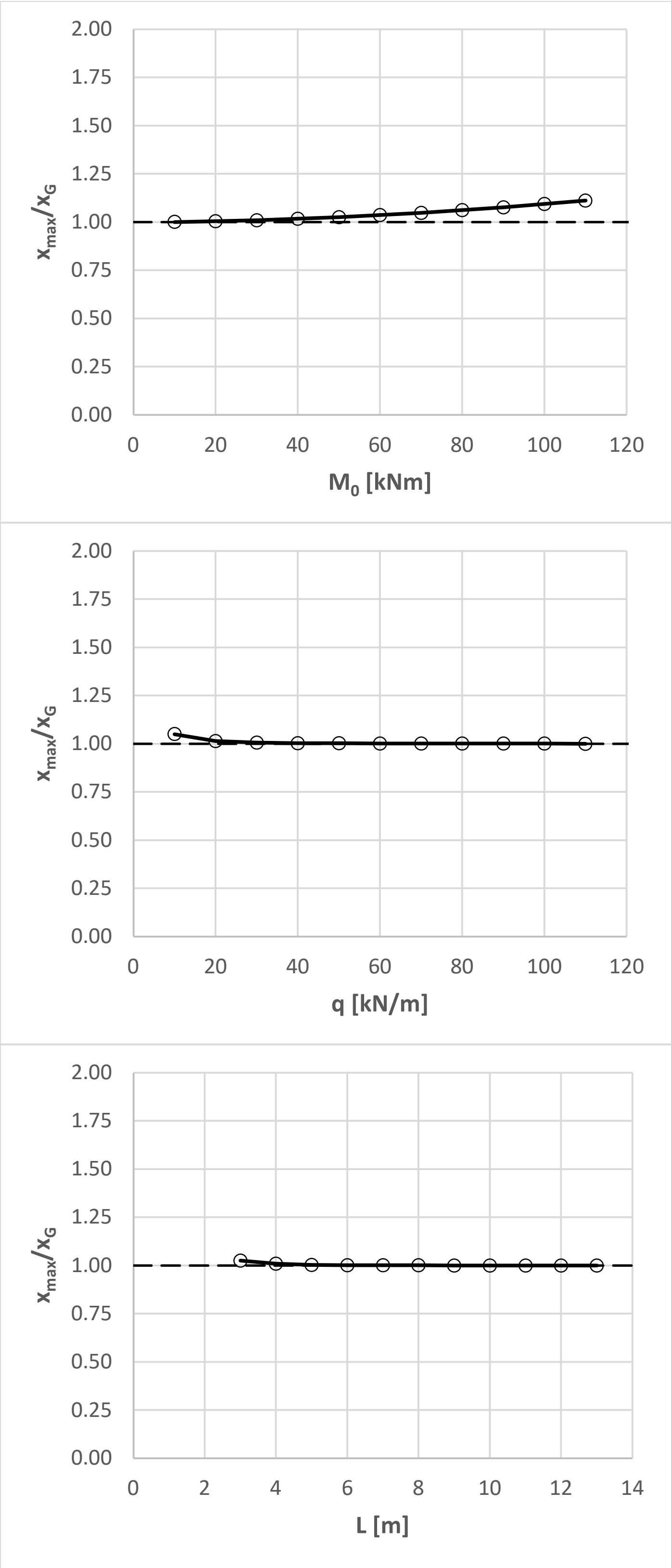
A la vista de las gráficas, se concluye que, para momentos $M_0$ pequeños (poca carga de viento y poca altura de pilar), la diferencia entre ambas funciones es despreciable (menor del 5%)



2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
$x_{max}/x_G$
0
20
40
60
80
100
120
$M_0$ [kNm]
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
$x_{max}/x_G$
0
20
40
60
80
100
120
q [kN/m]
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
$x_{max}/x_G$
0
2
4
6
8
10
12
14
L [m]