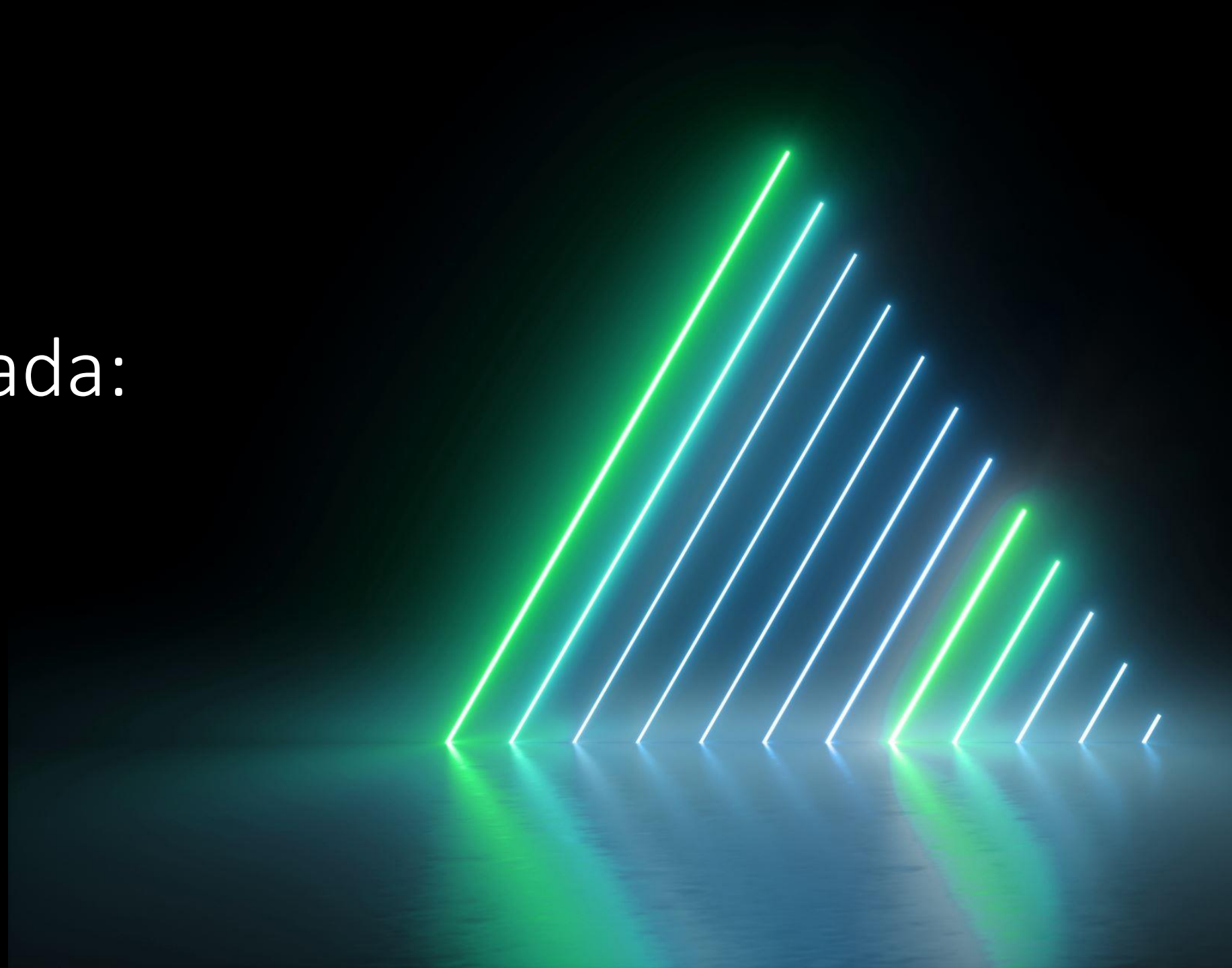
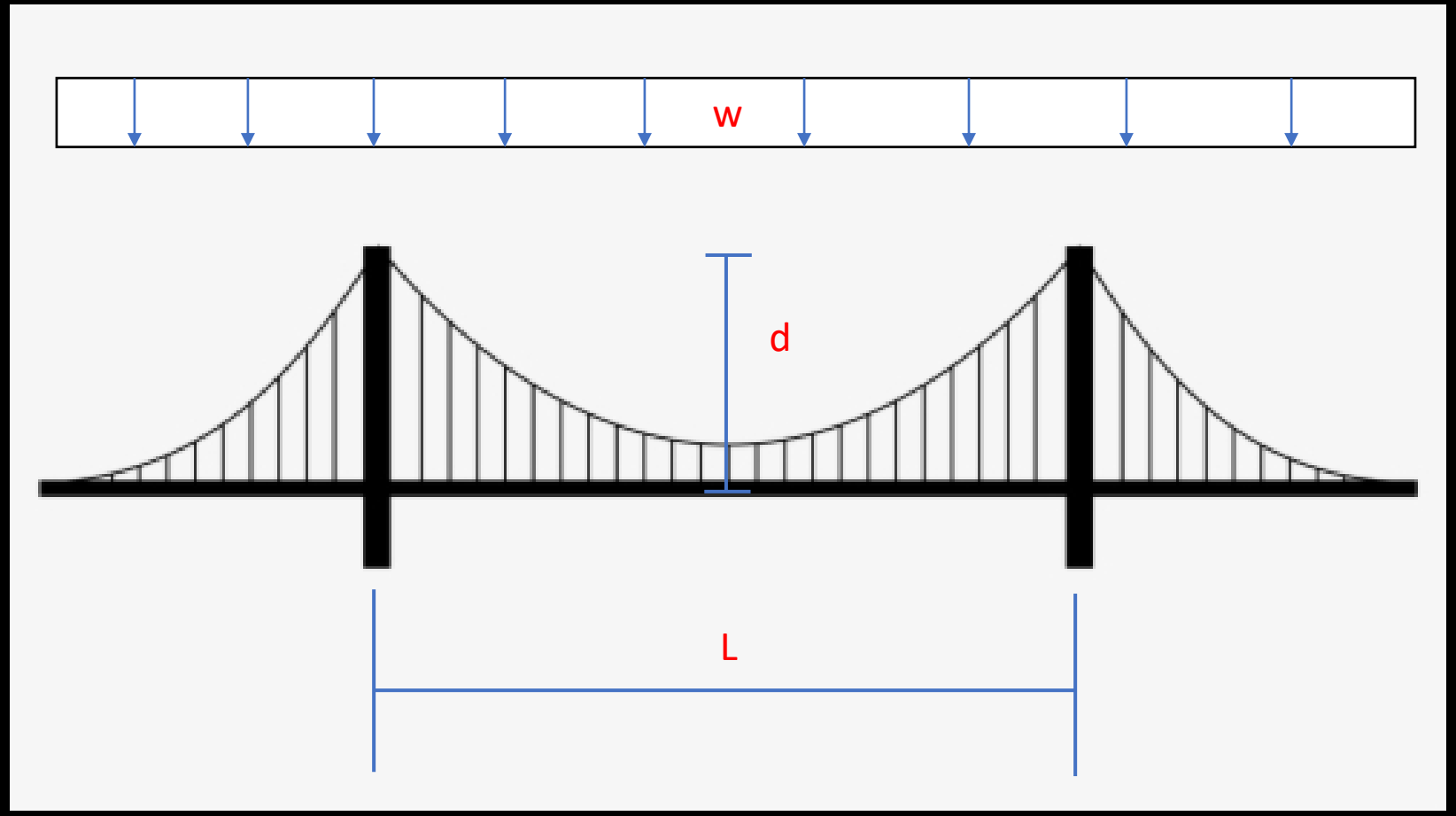
Final Enchilada: Suspension Bridges

Alec Holt

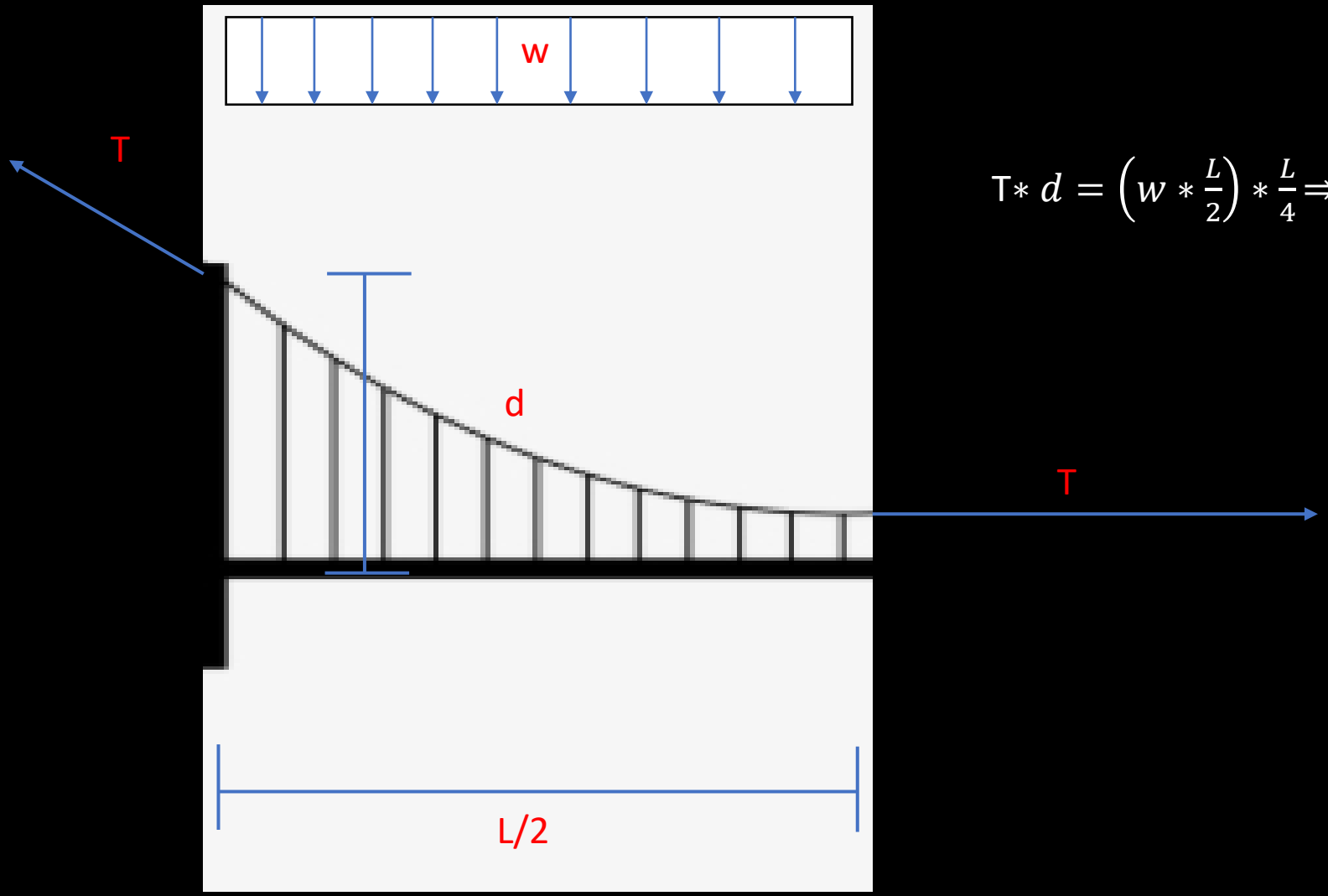
Not Cable-Stayed Bridges



The Basics



FBD!



$$T * d = \left(w * \frac{L}{2}\right) * \frac{L}{4} \Rightarrow \boldsymbol{T = \frac{wL^2}{8d}}$$

Cable Shape

$$\frac{d^2y}{dx^2} = \frac{w}{T_0}\sqrt{1+\left(\frac{dy}{dx}\right)^2},$$

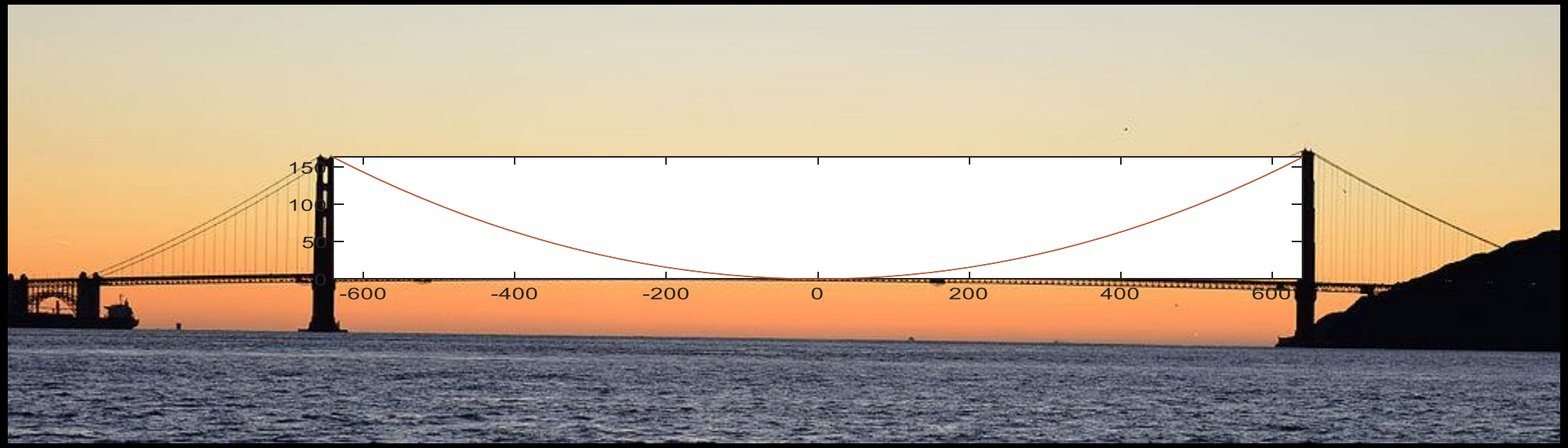
Matlab Intermission

Let’s see if my code makes sense

- Golden Gate Bridge
- Brooklyn Bridge
- We can try

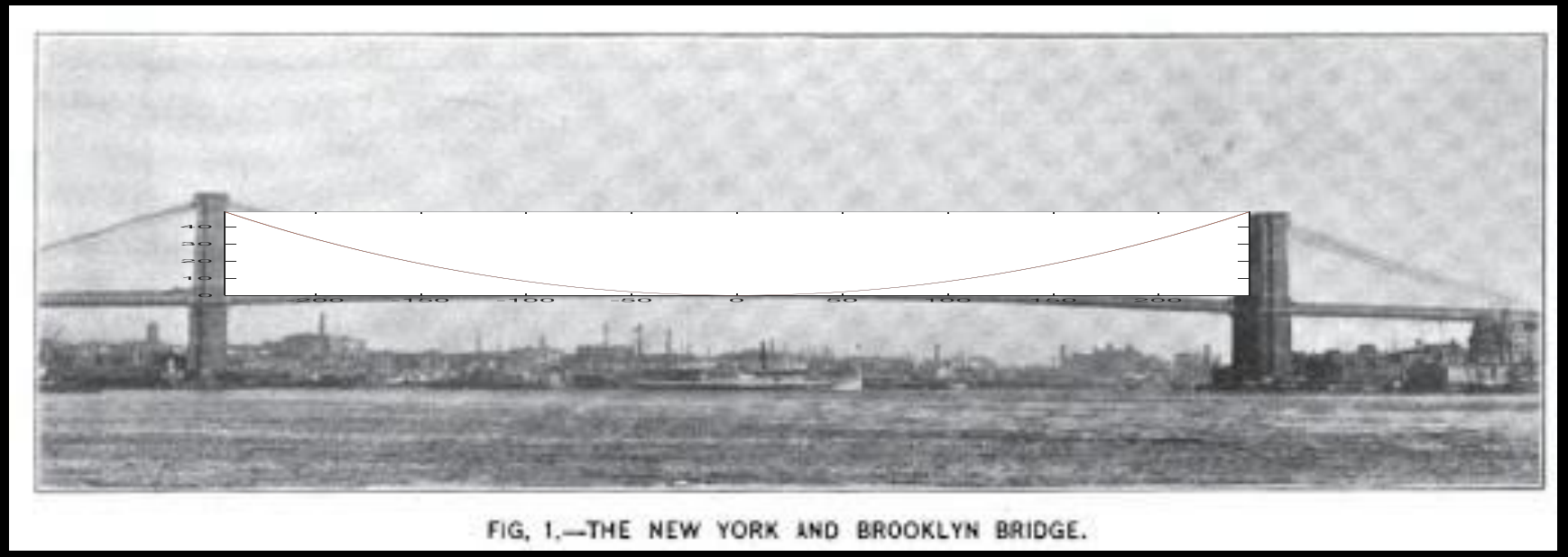
Golden Gate

- $w = \frac{380{,}800{,}000\ kg}{2737\ m} = 139000\ \frac{kg}{m}$
- $L = 1280\ m$
- $d = 160\ m$
- $\frac{L}{d} = 8$



Brooklyn

- $w = \frac{6005563\ kg}{1053\ m} = 5700\ kg/m$
- $L = 486\ m$
- $d = 48\ m$
- $\frac{L}{d} = 10$

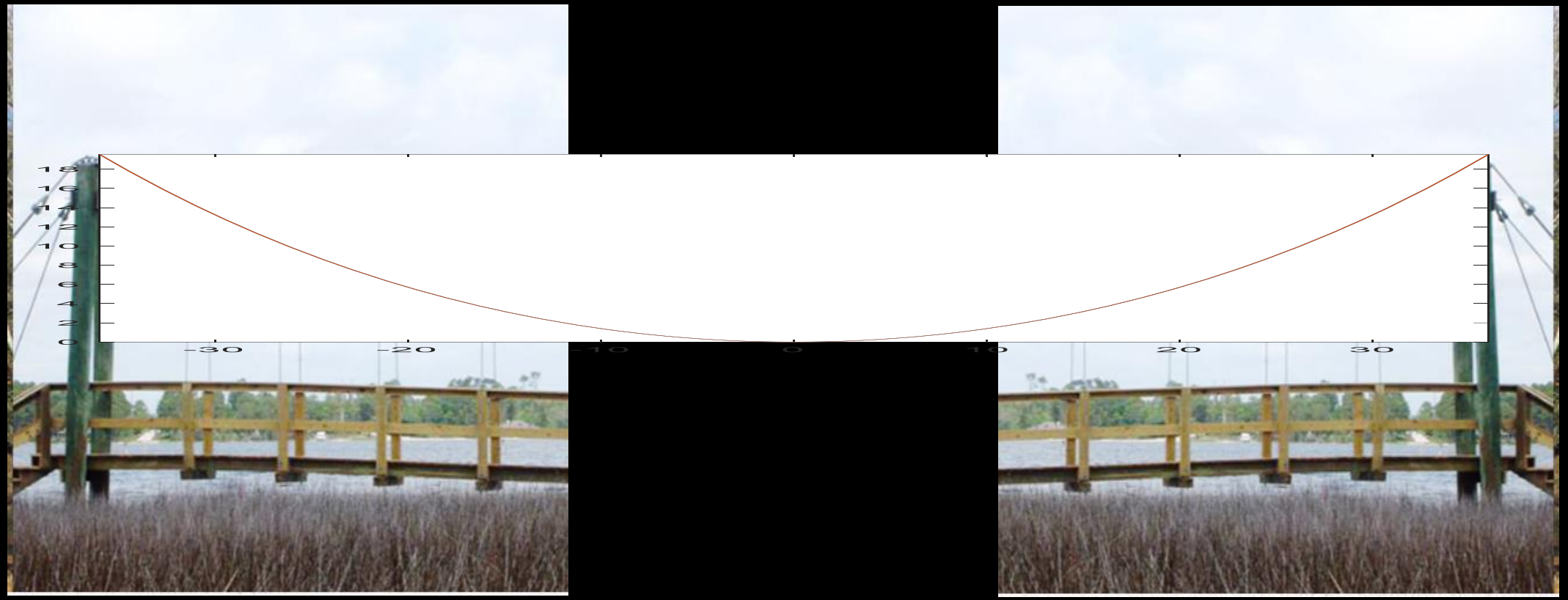


FIG, 1.—THE NEW YORK AND BROOKLYN BRIDGE.

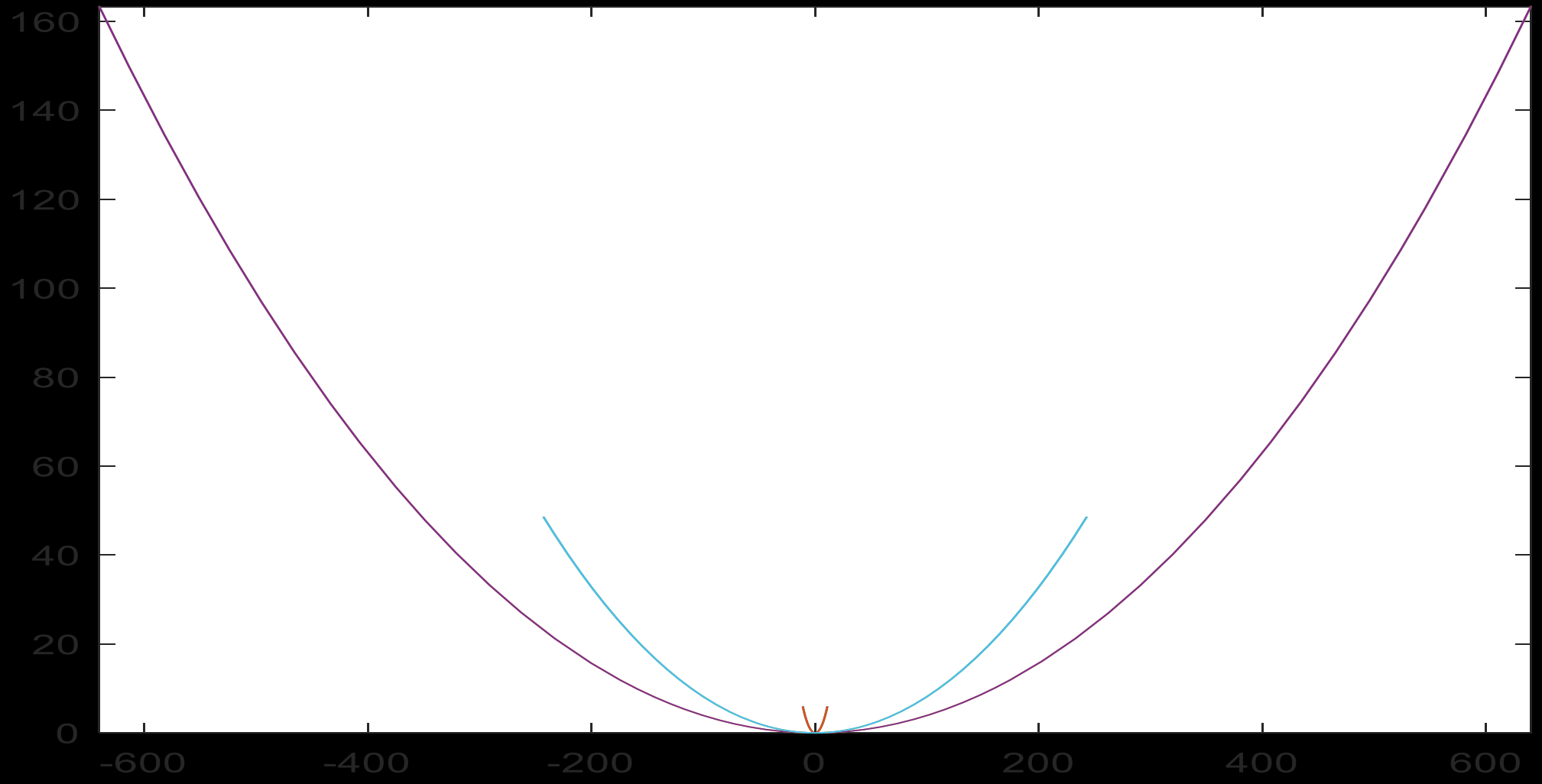
Guesswork

- $w = \frac{3000\ lb}{85\ ft} = 35\frac{lb}{ft} = 50\frac{kg}{m}$
- $L = 72\ ft$
- $d = 18\ ft$
- $\frac{L}{d} = 4$

Let’s try it



All together now



Thanks!