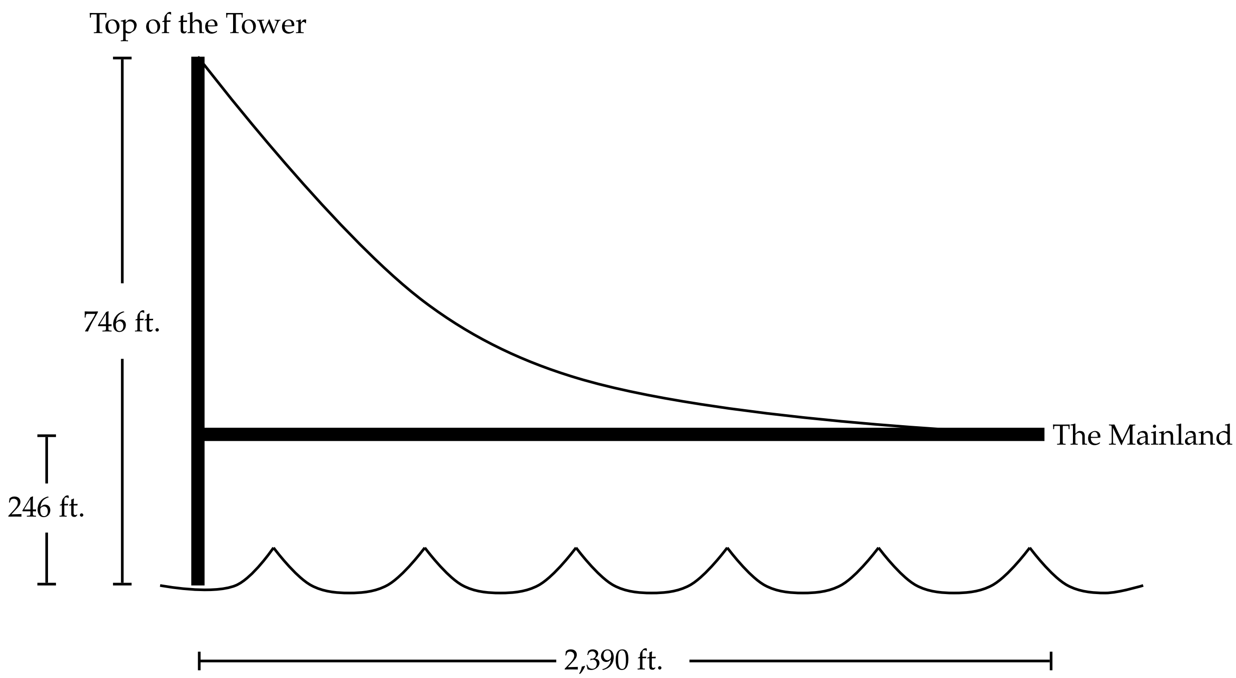
9. San Francisco's famous Golden Gate bridge has two towers which stand 746 ft. above the water, while the bridge itself is only 246 ft. above the water. The last leg of the bridge, which connects to Marin County, is 2,390 ft. long. The suspension cables connecting the top of the tower to the mainland can be modeled by an exponential function. Let $H(x)$ be the function describing the height above the water of the suspension cable as a function of x, the horizontal distance from the tower.



(a) (4 points) Find a formula for $H(x)$.

We are looking for a formula of the form $H(x) = H_0 a^x$. We can use the given information to extract the two points which we'll use to find our exponential function: (0,746) and (2390,246). The first of these points gives use the initial value, and from the second we can form the equation $246 = 746a^{2390}$, which can be solved for a. Thus, our final equation is $H(x) = 746(0.9995)^x$, or $H(x) = 746e^{-0.000464x}$.

(b) (4 points) The engineers determined that some repairs are necessary to the suspension cables. They climb up the tower to 400 ft above the bridge, and they need to lay a horizontal walking board between the tower and the suspension cable. How long does the walking board need to be to reach the cable?

We are looking for an x-value, given that the height up the tower is $246 + 400 = 646$. Thus, we must solve the equation $646 = 746(0.9995)^x$. Solving this equation yields about 287.78 ft, or, if using the second form, $x \approx 310$ ft. (Note: the variance in answers is due to round-off in the representations. Either form is accepted.)