Area Maximization

Problem 1:

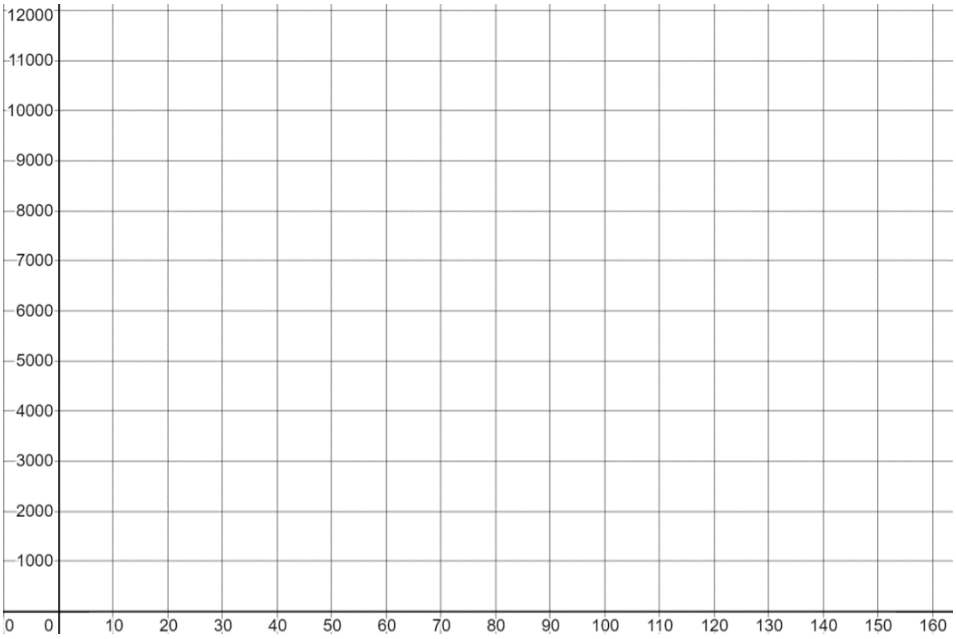


300 meters of fence is used to plot out a rectangular piece of land along a river.

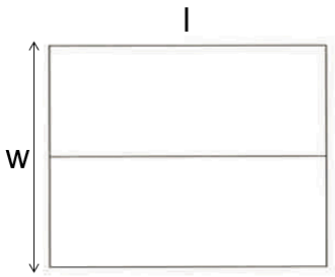
1. Write an equation for the length of fence.
2. Use your equation to rewrite the length (l) ***in terms of w***.
3. Write an equation for the area of the land ***in terms of w***. A =

What dimensions will maximize the area? What is this maximum area?

Find the x-intercepts and use them and the vertex to sketch a graph of the area function.



Problem 2:



You have 200 m. of fence and create the enclosure shown.

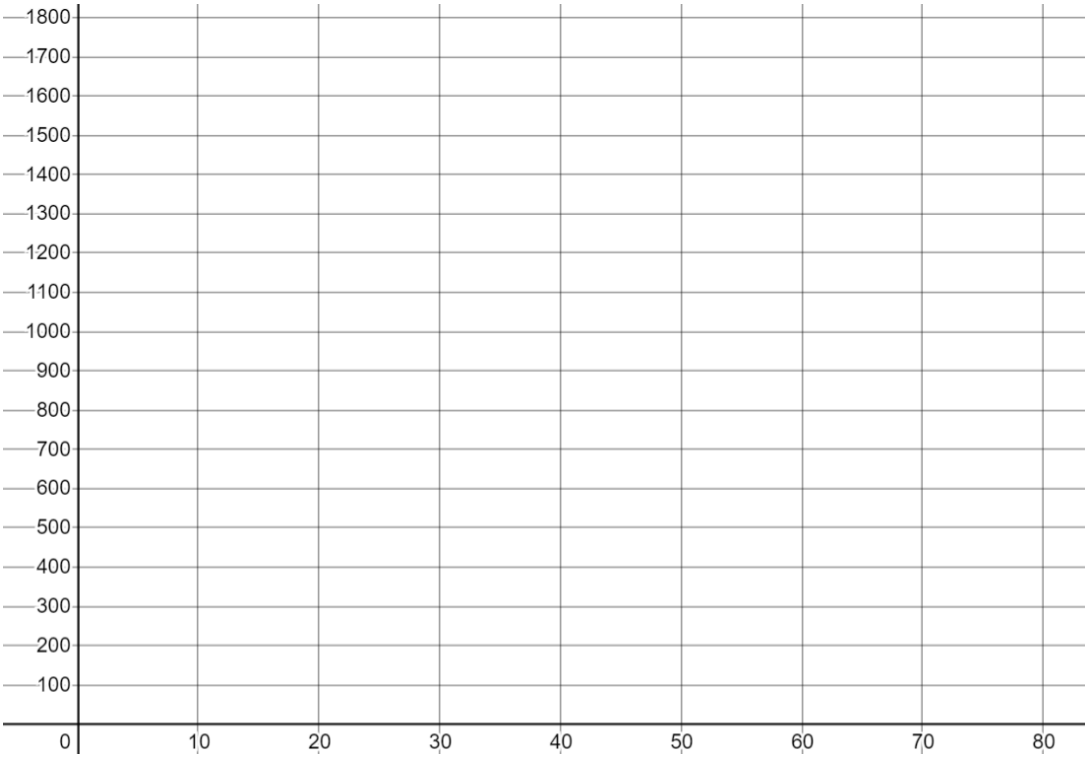
1) Write an equation for area using l and w.

2) Write an equation to show the total length of fencing.

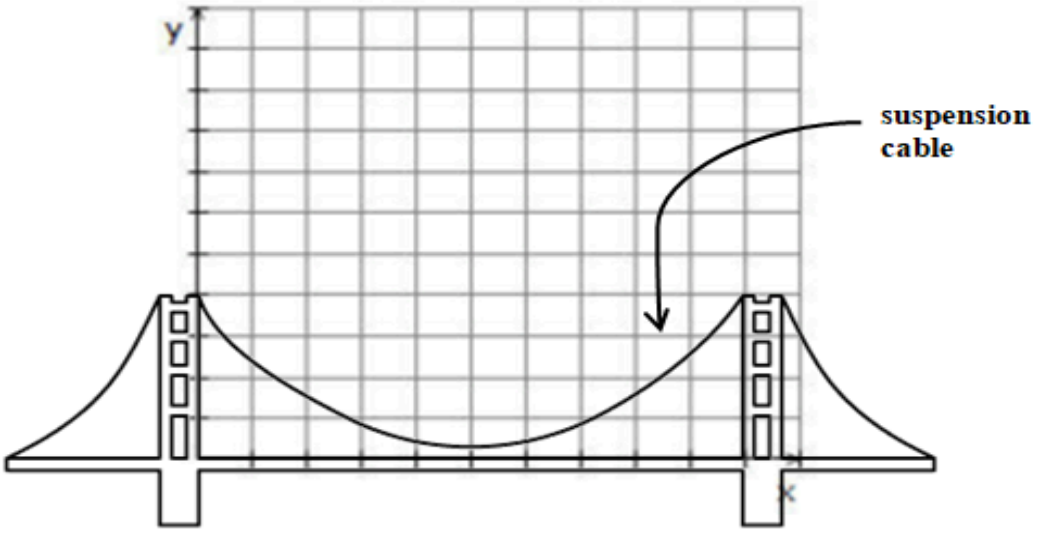
3) Combine the two equations to write an equation for area in terms of l only.

4) Find the values of l and w that lead to the maximum area. What is this area?

Find the x-intercepts and use them and the vertex to sketch a graph of the area function.



Problem 3:



Model (equation) of suspension cable:

$$y = \left(\frac{1}{2730}\right)(x-640)^2 + 3$$

What form is this quadratic given in?

What values can you immediately get from this form? a? b? c? vertex?

Scale the x-axis based on the equation given.

1. Even at its lowest point, the Bridge's suspension cable is above the road surface. Mark this point on the diagram. Find the height of the suspension cable above the road.

2. Find the length of the Golden Gate Bridge (tower to tower). Show this length on the diagram.

3. The Golden Gate Bridge was built in 1937. It has the tallest towers of any bridge built before 1995. Mark the TWO points on the diagram which show where the cables connect to the top of each tower. Calculate the height of each of the towers using the equation for the model of the suspension cable.

4. Workers often have to climb along the Golden Gate Bridge's cables to do maintenance.

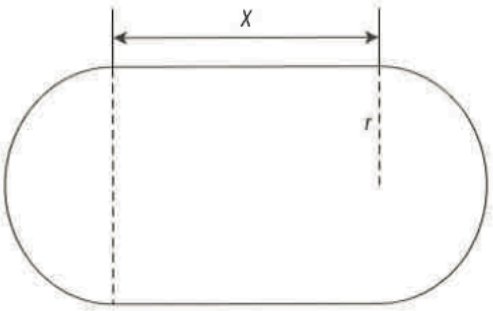
A worker is a horizontal distance of 300 meters from the left tower. Mark this point on the diagram. Calculate the worker's height above the road surface when she is at this point along the cable.

5. There is another point on the cable at which the worker would be at the same height from the road surface as you calculated in #4. Label this second point clearly on the diagram. Calculate the worker's horizontal distance from the left tower at this point.

6. A worker is at a height of 100 meters above the road surface. Label the TWO points where this occurs. Calculate to find how far from each tower the worker is at each of these points.

Problem 4:

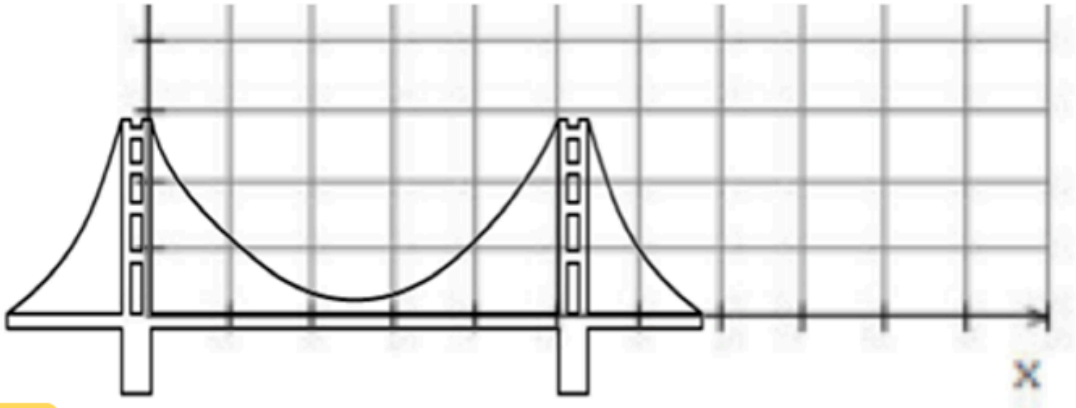
The perimeter of an athletics track is 0.4 km. The track has two parallel sides and a semicircle at each end. Determine the exact values of x and r that would maximize the area of the rectangular part of the track field, and use these dimensions to find the area of the entire track field to the nearest square meter.



Back to Problem 3…

7. A new suspension bridge being built has a tower to tower distance that is twice as long as the Golden Gate Bridge but the towers are the same height above the road surface as the Golden Gate.

Add a curve to represent the cable of the new bridge to the diagram below of the Golden Gate Bridge.



Challenge:

8. Create a model (equation) for the new bridge.

9. Calculate the two points at which the two **curves** representing the bridge cables intersect.