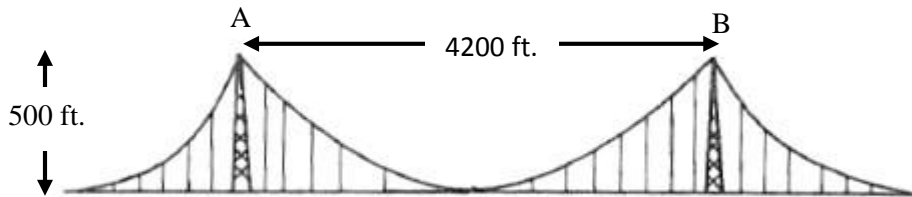


## Engineering Models II: Homework #8

You will definitely want to use the MATLAB symbolic toolbox to evaluate the definite integrals. Show all your work and include all of your MATLAB commands. **Include units in your answer!**

**Problem 1:** Find the length of the cable *running from point A to point B* for the suspension bridge shown below. Assume a parabolic curve. *Be sure to indicate where you chose the origin (0,0) to be.*



**Problem 2:** The St. Louis Arch is constructed from a set of double walled equilateral triangular sections stacked on top of one another. Each triangular section is placed so that it's centroid is on an inverted catenary curve.

The following website has a nice picture of this:

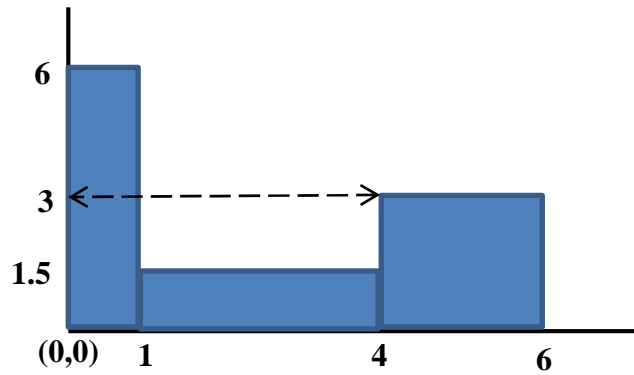
<http://bloximages.newyork1.vip.townnews.com/stltoday.com/content/tncms/assets/v3/editorial/d/25/d25d05c0-acc7-11df-8dd4-0017a4a78c22/4c6f332bc57c6.preview-620.jpg>  
<http://www.jug.net/wt/arch02.gif>

The equation for the inverted catenary (centroid) curve is given by:

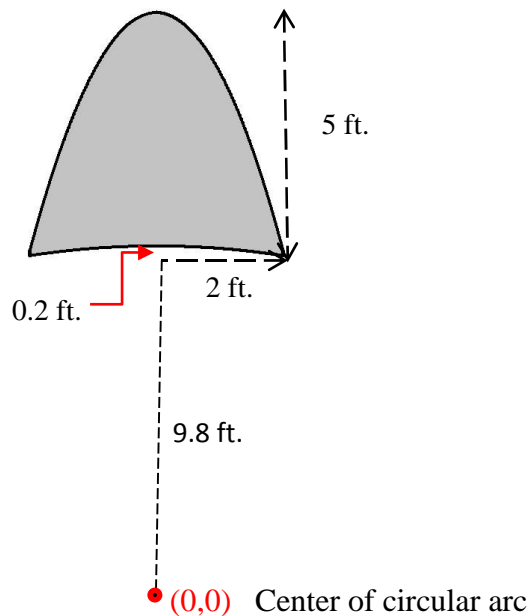
$$y = 693.8597 - 68.7672 * \cosh\left(\frac{3.0022 x}{L}\right)$$

$L = 299.2239$  ft. and represents half of the length of the base of the centroid curve as shown in the diagram above. Both  $y$  and  $x$  are also in feet. Calculate the length of the centroid curve for the St. Louis Arch. (Note: the hyperbolic cosine function,  $\cosh$ , in MATLAB is simply  $\cosh$ ).

**Problem 3:** Find the centroid of the object shown below. Assume units of centimeters and use origin shown.



**Problem 4:** The diagram below is of an odd-shaped window. The top of the window is a *parabola* and the bottom of the window is a portion of a *circle* with a radius of 10ft. Find the centroid of the window. *Note: use the origin indicated in the diagram.*



**Problem 5:** The diagram below is of a blade for a small windmill. The right side is a semicircle and the left side is a trapezoid (lines). Find the the centroid of the blade as measured from the left side of the blade. *Note: use the origin indicated in the diagram.*

