

# Hanging Chains

## Pre-Activity Questions

1. When a chain is hung from its two ends (spread apart), what type of shape do you think best represents it—linear or quadratic? Explain why you think so and write the general equation of the resulting graph.
2. If a point on a graph falls between two grid lines, how can you estimate the coordinates of the point?
3. A  $y$ -intercept has two coordinates. Which one is always 0? Why?
4. How is a *parabola* related to a *quadratic* function or graph? What is a *catenary*?

5. Describe the differences between a quadratic function and a linear function. How can you detect the difference from their equations? How can you detect the difference from their graphs?
6. Substitute the point (3, 4.2) into the equation  $y = ax^2 + bx + c$ . What values are known from this information, and what values remain unknown from this information?

## Summary Questions:

1. Name several things in the world outside of mathematics that are either catenaries or parabolas.
2. In the equation of a parabola,  $y = ax^2 + bx + c$ , why are  $a$ ,  $b$ , and  $c$  considered constants, but  $x$  and  $y$  are variables? After all,  $a$ ,  $b$ ,  $c$ ,  $x$  and  $y$  are all letters that represent numbers, right?
3. If a graph has an equation of the form  $y = mx^3 + kx$ , and the point  $(8, 5)$  is on the graph, show how you would substitute the coordinates into the equation.
4. If a graph has an equation of the form  $y = mx^3 + kx$ , how many points on the graph would you need to know in order to find the values of  $m$  and  $k$ ? Explain how you know.
5. Discuss what it means to say that  $x$  and  $y$  are variables but  $m$  and  $k$  are constants in the equation  $y = mx^3 + kx$ .