**Transforming Functions in Standard Form to Vertex Form**

It is often useful to convert a quadratic function from one form to another. For example, suppose the function $f\left(x\right)=-0.5x^{2}+32x$ models the height, *f*(*x*), of a missile in meters *x* seconds after the missile is launched. Knowing the vertex of this function could help a spy plane avoid being hit by the missile.

1. Use your graphing calculator to graph the function representing the height of the missile. Sketch a rough copy of this graph on the grid provided.



1. Identify the values of the two *x*-intercepts.
2. Identify the coordinates of the vertex and

draw the line of symmetry on your graph.

1. What do you notice about the *x*-coordinate

of the vertex compared to the *x*-intercepts?

Remember: The *x*-coordinate of the vertex can be found using the formula $–\frac{b}{2a}$.

1. Now that you have identified the *x*-coordinate of the vertex, show how you could calculate the *y*-coordinate of the vertex.
2. The vertex of the equation is (32, 512). Write a function in vertex form that models the height of the missile.

The Guinea Road Bridge over the Merritt Parkway in Stamford, Connecticut is built on a parabolic arch of stone. The function $y=-0.01x^{2}+0.8x$ is a good model for the parabolic arch. When applying this function, the origin is a point 10 feet above the road’s surface at one side of the road. In this model, *y* is the height of the arc in feet above the origin and *x* is the horizontal distance in feet from the origin. A photo of this bridge may be found at [www.past-inc.org/historic-bridges/image-merritt-guineard.html](http://www.past-inc.org/historic-bridges/image-merritt-guineard.html).

1. Use your graphing calculator to graph the function representing the parabolic arch.



1. Identify the values of the two *x*-intercepts.
2. Identify the coordinates of the vertex and

draw the line of symmetry on your graph.

1. What do you notice about the *x*-coordinate

of the vertex compared to the *x*-intercepts?

1. Find the equation of the line of symmetry.
2. Now that you know the *x-*coordinate of the vertex, show how to find the *y-*coordinate of the vertex.

6. Write a quadratic function in vertex form that models the parabolic arch.

7. Find the coordinates of the point on the surface of the road that lies directly below the vertex.

8. What is the maximum height of the arch measured from the road?