**Activity 5.7.2b Parabolas in the Coordinate Plane**

Definition: A **parabola** is the locus of points in a plane that are equidistant from a fixed point (called the **focus**) and a given line (called the **directrix**).

Open the file ctcoregeomACT572.ggb.

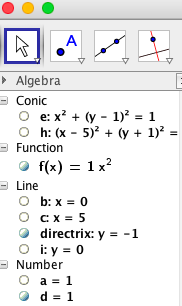
1. Find each of these distances:

*P*1*Q*1 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *P*1*F* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*P*2*Q*2 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *P*2*F* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   
*P*3*Q*3 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *P*3*F* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   
*P*4*Q*4 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *P*4*F* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What do you notice about the pairs of distances found in question 1?
2. In Activity 5.7.1 you learned the definition of parabola given in the box above. *P*1, *P*2, *P*3, and *P*4 lie on the same parabola.  
     
   a. What are the coordinates of the focus of this parabola? (\_\_\_, \_\_\_\_)

b. What is the equation of the directrix of this parabola? *y*= \_\_\_\_\_\_\_

1. Point *V*(0,0) is the vertex of this parabola.   
     
   a. Show that *V* lies on the parabola.  
     
     
     
   b. *V* is the midpoint of which line segment?
2. The slider in the upper left corner of the screen sets the distance (*d*) of a point on the parabola to the focus and to the directrix. Move the slider. What do you observe?
3. Now turn on the function *f*(*x*) = *ax*2 by clicking in the open circle next to *f*(*x*) in the algebra window.  
     
   How is this new parabola compare with the one you created with the slider?
4. Experiment by changing the value of *a.* (Type *a* = in the input window). Find the value of *a* so that *f*(*x*)matches the parabola you created with the slider, and record that value here:  
     
   *a* = \_\_\_\_\_.