Exploration 6

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A parabola is the set of points equidistant from a line, called the directrix, and a fixed point, called the focus. Assume the focus is not on the line. Construct a parabola given a fixed point for the focus and a line segment for the directrix.

Use an Action Button to generate the parabola from an animation and trace of a constructed point.
Then repeat this process with a trace of the tangent line at the constructed point.
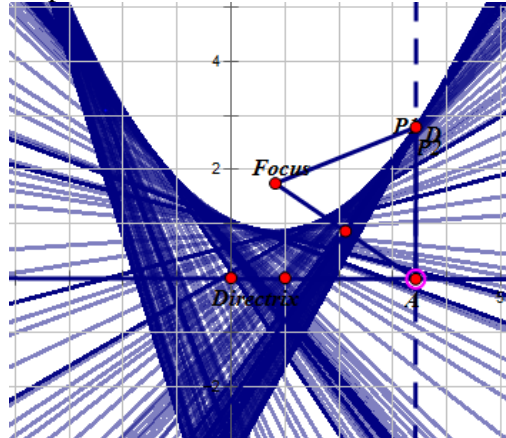Use the locus command to generate the parabola from a constructed point or the tangent line at that point.

In order to construct the parabola we will first construct a line segment called the directrix and an arbitrary point above the directix called the focus. We then will find any point on the directrix (I chose point A) and draw a line from that point to the focus. We will then draw a perpendicular line (p1) that goes through the midpoint of this line segment. We will also draw a segment (p2) perpendicular to the directrix that intersects our point A. The intersection of these two perpendicular lines is point D. A line segment will then be drawn between the focus and point D. The intersection point D is equidistant from our focus point and our arbitrary point A on the directrix. This parabola is in the first GSP file. You can drag point A along the directrix to get our parabola.
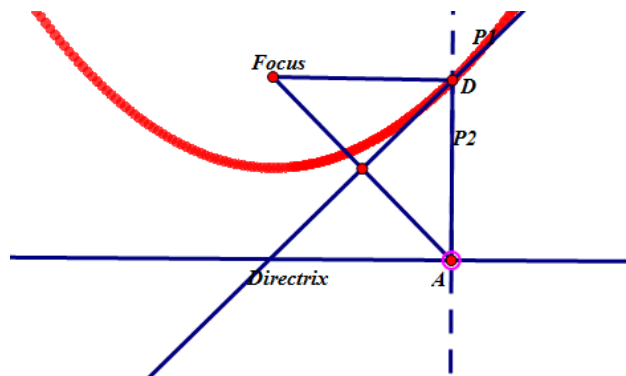
We will now repeat the same process but instead of tracing point D to create the parabola we will now trace the tangent line P1 at point D. This demonstration is in the second GSP File.

Last we will use the locus command to generate the parabola. We will repeat the same construction but instead of tracing and moving one point we will look for locus points equidistant from the focus point and the directrix. To do this we will select points D and A, and then select the locus command. We can see this in our third GSP file.