Problem 1 – Numbers of Possible Intersection Points

Use the **Circle** command in the DRAW menu to create a circle. Then use the **Horizontal** or **Vertical** commands to draw a line. Use the arrow keys to move the line.

- How many intersection points are possible for a line and a circle?

Use **ClrDraw** to clear the circle and line. Graph the parabola $y = x^2 + 3$. Then draw a line.

- How many intersection points are possible for a line and a parabola?

- Make a conjecture about number of intersection points for the graphs of a linear function and a conic section.

Confirm your conjecture by graphing the following functions with the positive square root in Y_1 and the negative square root in Y_2. Use the horizontal and/or the vertical lines to determine the number of intersection points possible.

– Ellipse: $\frac{x^2}{25} + \frac{y^2}{16} = 1 \rightarrow y = \pm 4\sqrt{1 - \frac{x^2}{25}}$

– Hyperbola: $\frac{x^2}{4} - \frac{y^2}{4} = 1 \rightarrow y = \pm 2\sqrt{\frac{x^2}{4} - 1}$

Graph the hyperbola above and draw a circle with radius 1 at the origin. Then, change the radius and center of the circle.

- How many intersection points are possible for a hyperbola and a circle?

Graph the hyperbola above and the parabola $y = x^2$. Change the coefficients of the parabola.

- How many intersection points are possible for a hyperbola and a parabola?

- Make a conjecture about number of intersection points for the graphs two conic sections.

Problem 2 – Two Parabolas

Graph two parabolas that intersect at 0, 1, 2, 3, and 4, points. Sketch the graphs and record your equations below.

Problem 3 – Solving Nonlinear Systems by Graphing

For each system, first write how many solutions are possible. Solve each system by graphing. Then sketch the graphs and write the solutions, rounded to the nearest hundredth.

- $\left\{\begin{array}{c} x^2+y^2=25 \\ 2x^2+6y^2=18 \end{array}\right\}$

- $\left\{\begin{array}{c} x+y=3 \\ y^2-8x=0 \end{array}\right\}$

- $\left\{\begin{array}{c} x^2-y^2=4 \\ y+x^2=-8x-19 \end{array}\right\}$

- $\left\{\begin{array}{c} x^2+y^2=15 \\ y+6=x^2 \end{array}\right\}$