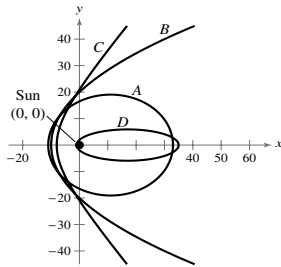## Collaborative Project – Rational Functions and Conics

1. The graph shows the paths of four comets that pass through our solar system, where $x$ and $y$ are measured in astronomical units. Each comet's path can be modeled by a conic equation with a focus at the sun.



a. Use the information about the conic corresponding to each comet to write equations in standard form for the orbits shown above. Then classify each comet's orbit as parabolic, elliptical, or hyperbolic.

| Comet | Vertex or Vertices |
|-------|--------------------|
| A | $(-11, 0), (33, 0)$ |
| B | $(-10, 0)$ |
| C | $(-34, 0), (-8, 0)$ |
| D | $(-1, 0), (35, 0)$ |

b. Which comets can be observed from the earth more than once? Explain.

c. Which comet's orbit is the closest to circular? Explain.

2. Another comet orbiting the sun has a perihelion of 5 AU and an aphelion of 19 AU. The path of the comet has a vertical axis and has an eccentricity of $\sqrt{95}/12$. Write an equation that represents the comet's path.

3. While researching, you discover an object traveling on a path that can be approximately modeled by $f(x) = \dfrac{1 + 0.02(x - 40)^2}{0.02x^2 - 1.7x + 32.0}$, where $x \le 28$.

a. Sketch the graph of $f$.

b. Identify any asymptotes of the graph that are within the range of the model.