Geometry of the Ellipse

Getting to an Equation

1. Write a, b, and f next to the appropriate segments on the figure. (Hint: use what you know about EF₁ + EF₂.)

2. How are a, b, and f related?

3. Find the length OS in terms of a, b, and/or f. (Hint: use what you know about SF₁ + SF₂.)

4. How are EF₁ and OS related?

5. Write an equation for the ellipse, assuming
   a. O is at the origin.
   b. O has coordinates (h,v).

Definitions: SL is the major axis. EI is the minor axis. 2f is the focal distance. PF₁ and PF₂ are the focal radii. OS and OL are the x-radii. OE and OI are the y-radii.

6. What are the x-radius and the y-radius in terms of a, b, and/or f?

Turning It Around

7. Sketch an ellipse centered at the origin, but with the foci on the y-axis. Mark a, b, and f wherever they show up on your sketch. (Hint: In this case, the major axis is vertical, and the minor axis is horizontal. The minor axis is still equal to 2b, and the focal distance is still equal to 2f.)

8. Write an equation for the ellipse, assuming
   a. O is at the origin.
   b. O has coordinates (h,v). (Hint: the answers are different from #5.)

Equation Challenges

9. Find the equation of an ellipse centered at the origin, with:
   a. major axis 6, focal distance 8, foci on the x-axis
   b. one focus at (0,6), sum of the focal radii 16.

10. Where are the foci if the center is at (2,3), the x-radius is 4, and the y-radius is 5.