Getting to an Equation

1. Write a, b, and f next to the appropriate segments on the figure. (Hint: use what you know about $EF_1 + EF_2$.)

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 $SF_1 + SF_2$.)

4. How are $EF_1$ 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. $PF_1$ and $PF_2$ 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.