

# Elliptical Reflections (prob11)

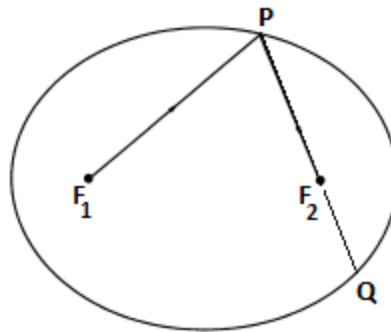
## The Problem

An ellipse has the interesting property that if one emits a signal from one of its foci, it will bounce off of a point on the ellipse and the signal is reflected through the other focus. See the figure below. For this problem, you will be given a focus  $F_1$ , a point  $P$  on the ellipse, and the other focus  $F_2$ . You are to determine the next point  $Q$ , on the ellipse, that will be hit when a signal is emitted from the first focus  $F_1$ , it bounces off the ellipse at  $P$  and then passes through  $F_2$ .

Recall, if  $P$  is a point on an ellipse having foci  $F_1$  and  $F_2$ , then  $|PF_1| + |PF_2| = 2a$ ,  $|F_1F_2| = 2c$  and the equation of the ellipse having center  $(h, k)$  is

$$(a^2 - c^2)(x - h)^2 + a^2(y - k)^2 = a^2(a^2 - c^2)$$

if the major axis, the line through  $F_1$  and  $F_2$ , is horizontal.



## Input

The input for each case will be on a line by itself. It will consist of six numbers  $x_1, y_1, x_0, y_0, x_2, y_2$  where  $P = (x_0, y_0)$ ,  $F_1 = (x_1, y_1)$ , and  $F_2 = (x_2, y_2)$ . The input will be terminated by a line of input where  $F_1 = F_2 =$  the origin. The last line is not to be processed. You may assume for all the other lines of input that  $F_1 \neq F_2$ , that the major axis of the ellipse is either vertical or horizontal, and that  $P$  is not on the segment  $F_1F_2$ . Also, the absolute value of any coordinate will not exceed 100.

## Output

For each line of output, output the coordinates of the point  $Q$  rounded to four decimal places.

### Sample Input

```
-5 0 19 5 5 0
-5 0 -17.800166 -8.142916 5 0
5 0 -19 5 -5 0
5 0 17.800166 -8.142916 -5 0
-3 4 21 9 7 4
0 -5 5 19 0 5
4 -3 9 21 4 7
0 0 0 0 0 0
```

### Sample Output

```
-17.8002 -8.1429
19.0000 5.0000
17.8002 -8.1429
-19.0000 5.0000
-15.8002 -4.1429
-8.1429 -17.8002
-4.1429 -15.8002
```