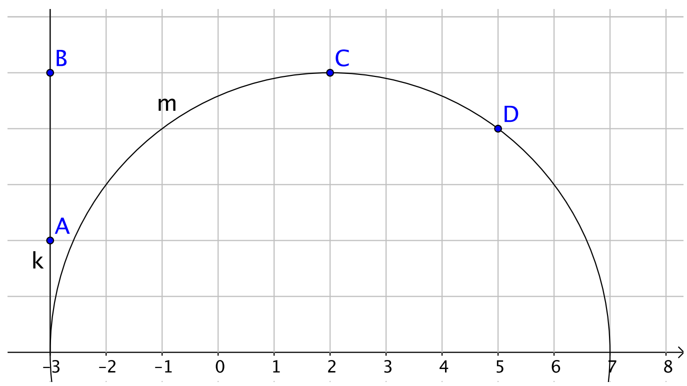
The following is a non-comprehensive list of solutions to homework problems. In some cases I may give an answer with just a few words of explanation. On other problems the stated solution may be complete. As always, feel free to ask if you are unsure of the appropriate level of details to include in your own work. Please let me know if you spot any typos and I'll update things as soon as possible.

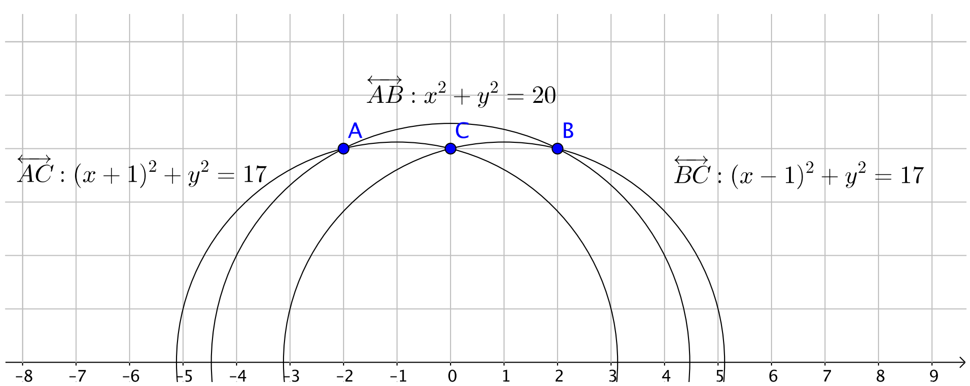
8.23: The points $(-3,5)$ and $(-3,2)$ are on the Poincare line $k : x = -3$. The points $(2,5)$ and $(5,4)$ are not on a Poincare line of the form $x = \lambda$. Hence they're on a line of the form $(x-\omega)^2 + y^2 = \rho^2$. We could try to find ω and ρ by trial and error, which would be slow and inexact, or plug $(2,5)$ and $(5,4)$ into the equation of the circle and solve this system for ω and ρ:

$$(2-\omega)^2 + 5^2 = \rho^2$$
$$(5-\omega)^2 + 4^2 = \rho^2$$

Alternatively, we talked about doing this in general for points (a,b) and (c,d), so you could just use the general formulas for ω and ρ on page 182, right before Proposition 8.2. Regardless of the method, we get $\omega = 2$ and $\rho = 5$, so the equation of the line is $m : (x-2)^2 + y^2 = 25$. It's evident from the picture below that k and m do not intersect at all; they *would* meet at $(-3,0)$, but that point is not included in either line, since $y > 0$ in the Poincare Half Plane.



8.24: The triangle is formed from segments of three Poincare lines, all of which have the form $(x-\omega)^2 + y^2 = \rho^2$. You can find the equations for them using the same techniques as in 8.23, although there are some shortcuts as well. (For example: A and C have the same y value. Any circle going through both of them will have a center whose x value is the average of their x values.)

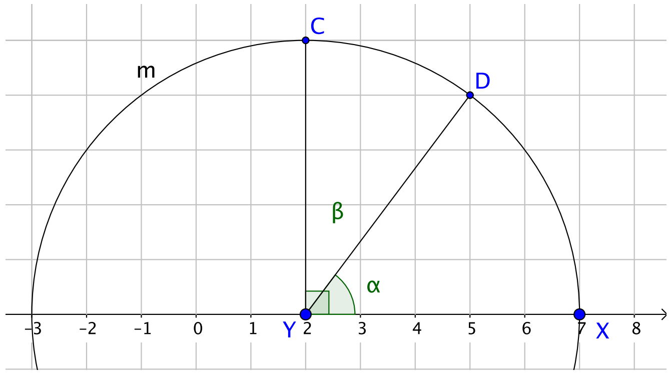


8.25: (i) The points $(-3, 5)$ and $(-3, 2)$ are on the Poincare line $x = -3$. The distance between them is given by $|\ln(5/2)| = \ln(5/2)$.

(ii) The points $(2, 5)$ and $(5, 4)$ are on the Poincare line $(x-2)^2 + y^2 = 25$. The distance between them is given by

$$\ln\left(\frac{\csc\beta - \cot\beta}{\csc\alpha - \cot\alpha}\right)$$

where $\alpha = |\angle XYD|$ and $\beta = |\angle XYC| = \pi/2$ as shown in the picture below.



Copying in values gives

$$\begin{aligned}\ln\left(\frac{\csc\beta - \cot\beta}{\csc\alpha - \cot\alpha}\right) &= \ln\left(\frac{1-0}{5/4 - 3/4}\right)\\ &= \ln\left(\frac{1}{2/4}\right)\\ &= \ln 2\end{aligned}$$