22. 0/1 points

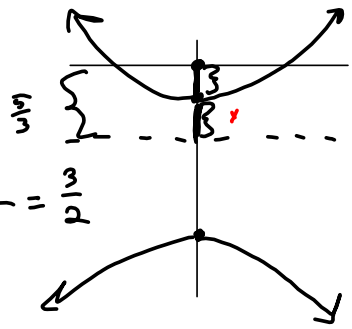
Find a polar equation of the conic in terms of r with its focus at the pole.

Conic	*Vertices*
Hyperbola	(1, 3π/2), (5, 3π/2)

$$r = \frac{5}{2 - 3\sin(\theta)}$$

$\frac{ep}{1-e\sin\theta}$ Dir below pole

$e > \frac{3}{2}$



$\frac{5}{3}$

What's p?

$\frac{1}{x} = \frac{3}{2}$

$x = \frac{2}{3}$

Need to play around with $(1, \frac{3\pi}{2})$ c.t. w/ $(-1, \frac{\pi}{2})$

$(5, \frac{3\pi}{2})$ c.t. w/ $(-5, \frac{\pi}{2})$

Why $(-1, \frac{\pi}{2}) \neq (5, \frac{3\pi}{2})$

Last time, we tried $(1, \frac{3\pi}{2}) \neq (-5, \frac{\pi}{2})$

$r(\frac{\pi}{2}) = -1$

$\frac{ep}{1-e\sin(\frac{\pi}{2})} = -1$

$\frac{ep}{1-e} = -1$

$ep = -1 + e$

$r(\frac{3\pi}{2}) = 5$

$\frac{ep}{1-e\sin(\frac{3\pi}{2})} = 5$

$\frac{ep}{1+e} = 5$

$ep = 5 + 5e$

$-1 + e = 5 + 5e$

$-4e = 4$

$e = -1$?

$e = 0$!

Try the other way:

$(1, \frac{3\pi}{2}), (-5, \frac{\pi}{2})$

$r(\frac{3\pi}{2}) = 1$

$\frac{ep}{1 - e\sin(\frac{3\pi}{2})} = 1$

$\frac{ep}{1+e} = 1$

$ep = 1 + e$

$r(\frac{\pi}{2}) = -5$

$\frac{ep}{1 - e\sin\frac{\pi}{2}} = -5$

$\frac{ep}{1-e} = -5$

$ep = -5 + 5e$

$1 + e = -5 + 5e$

$-4e = -6$

$e = \frac{3}{2}$

$\frac{ep}{1+e} = \frac{\frac{3}{2}p}{1+\frac{3}{2}} = \frac{\frac{3}{2}p}{\frac{5}{2}} = (\frac{3}{2})(\frac{2}{5})p = \frac{3}{5}p = 1$

$p = \frac{5}{3}$

$\frac{ep}{1 - e\sin\theta} = \frac{\frac{3}{2}\cdot\frac{5}{3}}{1 - \frac{3}{2}\sin\theta} = \frac{\frac{5}{2}}{1 - \frac{3}{2}\sin\theta} = \frac{5}{2 - 3\sin\theta}$

25. 0/1 points

The polar equation of the hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \text{ is } r^2 = \frac{-b^2}{1 - e^2\cos^2\theta}.$$

$r^2 = \frac{-16}{1-\left(\frac{5}{3}\right)^2\cos^2\theta}$

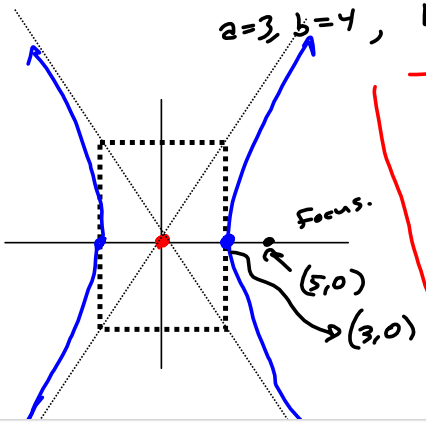
Use the result above to write the polar form of the equation of the conic.

$$\frac{x^2}{9} - \frac{y^2}{16} = 1 \iff \frac{x^2}{3^2} - \frac{y^2}{4^2} = 1$$

$= r^2 = -\frac{16}{1-\frac{25}{9}\cos^2\theta}$

$c =$ $= -\frac{144}{9-25\cos^2\theta}$

$$r^2 = -\frac{144}{9 - 25\cos^2(\theta)}$$



6.4 stuff needed

$c^2 = a^2+b^2 = 3^2+4^2 = 9+16 = 25$

$c = 5$

$\frac{c}{a} = \frac{5}{3} = e$

Definition of a Hyperbola

A **hyperbola** is the set of all points (x, y) in a plane for which the absolute value of the difference of the distances from two distinct fixed points **(foci)** is constant. See Figure 6.20.

$e = c/a$