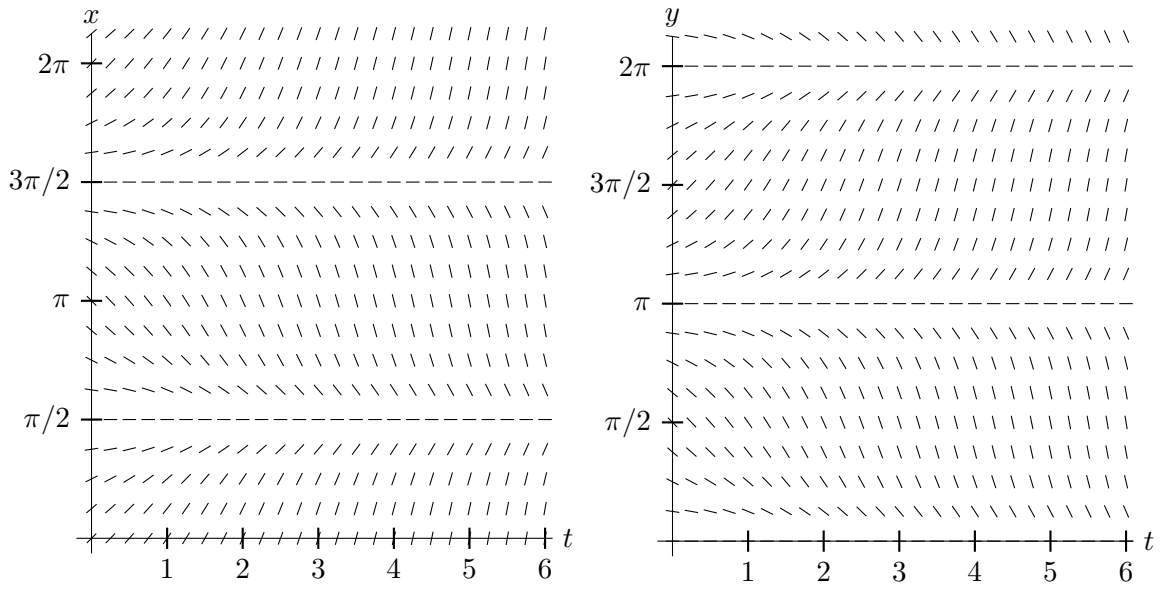
8. [8 points] Suppose Xena the cat is running around the backyard while wearing a tracking device on her collar. The device measures her x- and y-coordinates in meters, with the origin set as the center of the yard. Suppose t is measured in minutes after Xena went outside. Xena's x- and y- coordinates satisfy the following differential equations for $t > 0$:

$$\frac{dx}{dt} = \cos(x)\sqrt{t^2 + \cos^2(x)} \quad \text{and} \quad \frac{dy}{dt} = -\sin(y)\sqrt{t^2 + \sin^2(y)}$$

Portions of the slope fields for these differential equations are shown below.



Note the following: One minute after she goes outside, Xena is at the point $(\pi, 3\pi/2)$.

a. [3 points] How fast is Xena traveling one minute after she goes outside?

Answer: Speed = _____ meters per minute

b. [3 points] Find the equation (in xy-coordinates) of the line tangent to Xena's path one minute after she goes outside.

Answer: $y =$ _____

c. [2 points] If Xena keeps running around the yard for a long time, what point (in xy-coordinates) in the yard will she approach?

Answer: _____