8. [12 points] Consider the system

$$
\begin{aligned}
x^{\prime} & =a x+2 x y \\
y^{\prime} & =3 y-y^{2}+b x y
\end{aligned}
$$

where $a$ and $b$ are constants. The direction field and phase portrait for the system are shown in the figure to the right. (Dots indicate initial conditions for the trajectories shown.)
a. [6 points] What are $a$ and $b$ ? Be sure to explain your answer.

b. [6 points] Suppose that $x$ and $y$ are populations of interacting species. What type of interaction is being modeled here? Explain what the phase portrait shown tells you about the behavior and expected long-term values of the populations and sketch a representative solution ( $x$ and $y$ ) against $t$.

