$$\frac{dx}{dt} = 4x - 2xy$$
$$\frac{dy}{dt} = -3y + 3xy$$

Predator-Prey system

$x(t)$, $y(t)$

Lotka-Volterra System

1. x — prey, y — predators

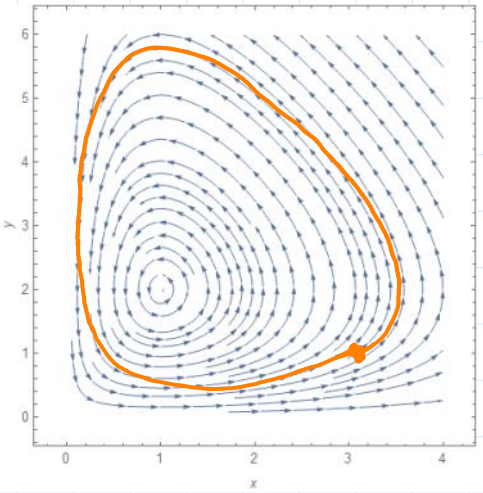
2. $0 = 4x - 2xy$, $0 = -3y + 3xy$ $\Rightarrow$ $0 = 2x(2-y)$, $0 = 3y(x-1)$

Equilibrium solutions: $(0,0)$, $(1,2)$

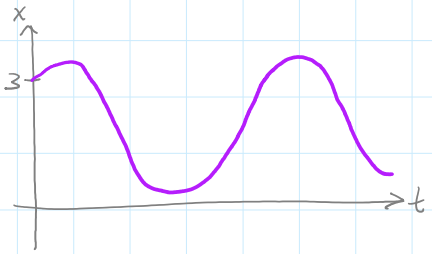
3. If $x(0) = 3$, $y(0) = 1$, then

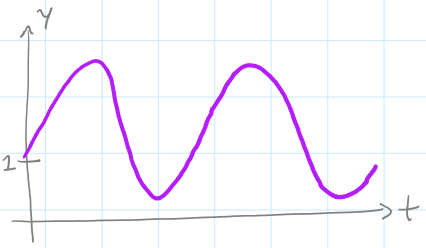
$\frac{dx}{dt} > 0$, $\frac{dy}{dt} > 0$

4.



5.





$$\frac{dx}{dt} = 2x\left(1 - \frac{x}{3}\right) - xy$$
$$\frac{dy}{dt} = 3y\left(1 - \frac{y}{5}\right) - 3xy$$

1. Competing

2. FACTOR!

$$x\left(2 - \frac{2}{3}x - y\right) = 0$$
$$3y\left(1 - \frac{y}{5} - x\right) = 0$$

$$2 - \frac{2}{3}x - y = 0$$
$$1 - \frac{y}{5} - x = 0$$

$(x,y) = (0,0), (0,5), (3,0), \left(\frac{9}{13}, \frac{20}{13}\right)$