Quiz 20   Name: _____ Key _____

You must show your work to get full credit.
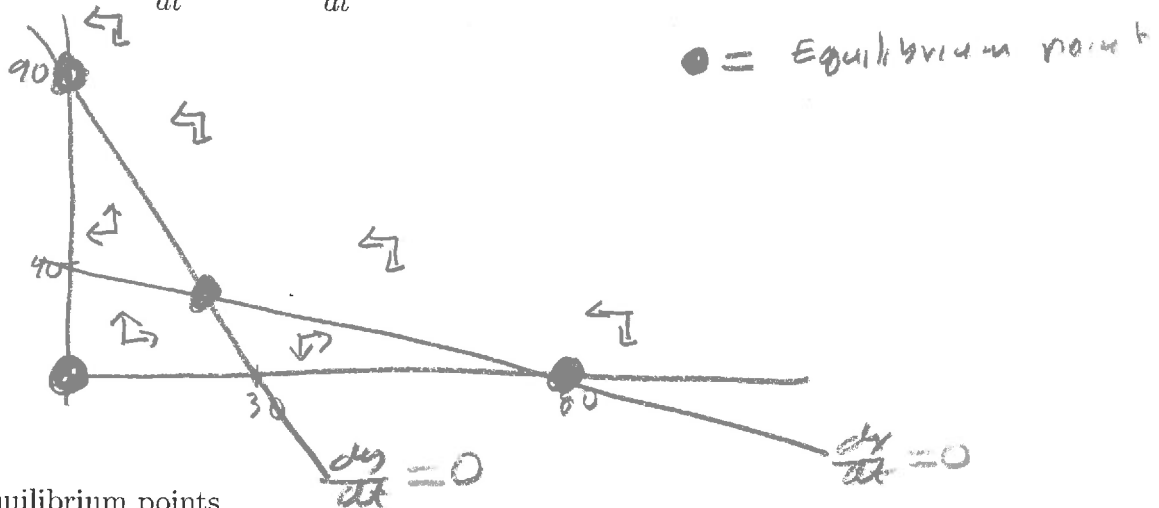
Consider the system of rate equations:

$$\frac{dx}{dt} = .2x\left(\frac{80 - x - 2y}{80}\right)$$

$$\frac{dy}{dt} = .3y\left(\frac{90 - 3x - y}{90}\right)$$

$x = 0,$ $x + 2y = 80$
x-intercept $(80, 0)$
y-intercept $(0, 40)$

$\overline{y = 0}$ $3x + y = 90$
x-intercept $(30, 0)$
y-intercept $(0, 90)$

for two competing species.

1. Draw the lines where $\dfrac{dx}{dt} = 0$ and $\dfrac{dy}{dt} = 0$.

● = Equilibrium point

2. Find the equilibrium points.

The equilibrium points are __(0,0), (80,0), (0,90), (20,30)__

① $x + 2y = 80$
② $3x + y = 90$

From ② $y = 90 - 3x$
Use this in ①
$x + 2(90 - 3x) = 80$
$x + 180 - 6x = 80$

$\Rightarrow -5x = -100$
$x = \dfrac{100}{5} = 20$

$y = 90 - 3x$
$= 90 - 60$
$= 30$

3. Which of the equilibrium points are stable.

The stable points are __(80, 0), (0,90)__