2.

A. Without competition, Paul's business propagates at a rate of dx/dt = 2x (exponentially); with no competition, Bob's business propagates at a rate of dy/dt = y (exponentially but less). The competition from Bob's café decreases Paul's profits by dx/dt = -y, and the competition from Paul's café decreases Bob's profits by dy/dt = -x, so they decrease each other's profits to the same degree.

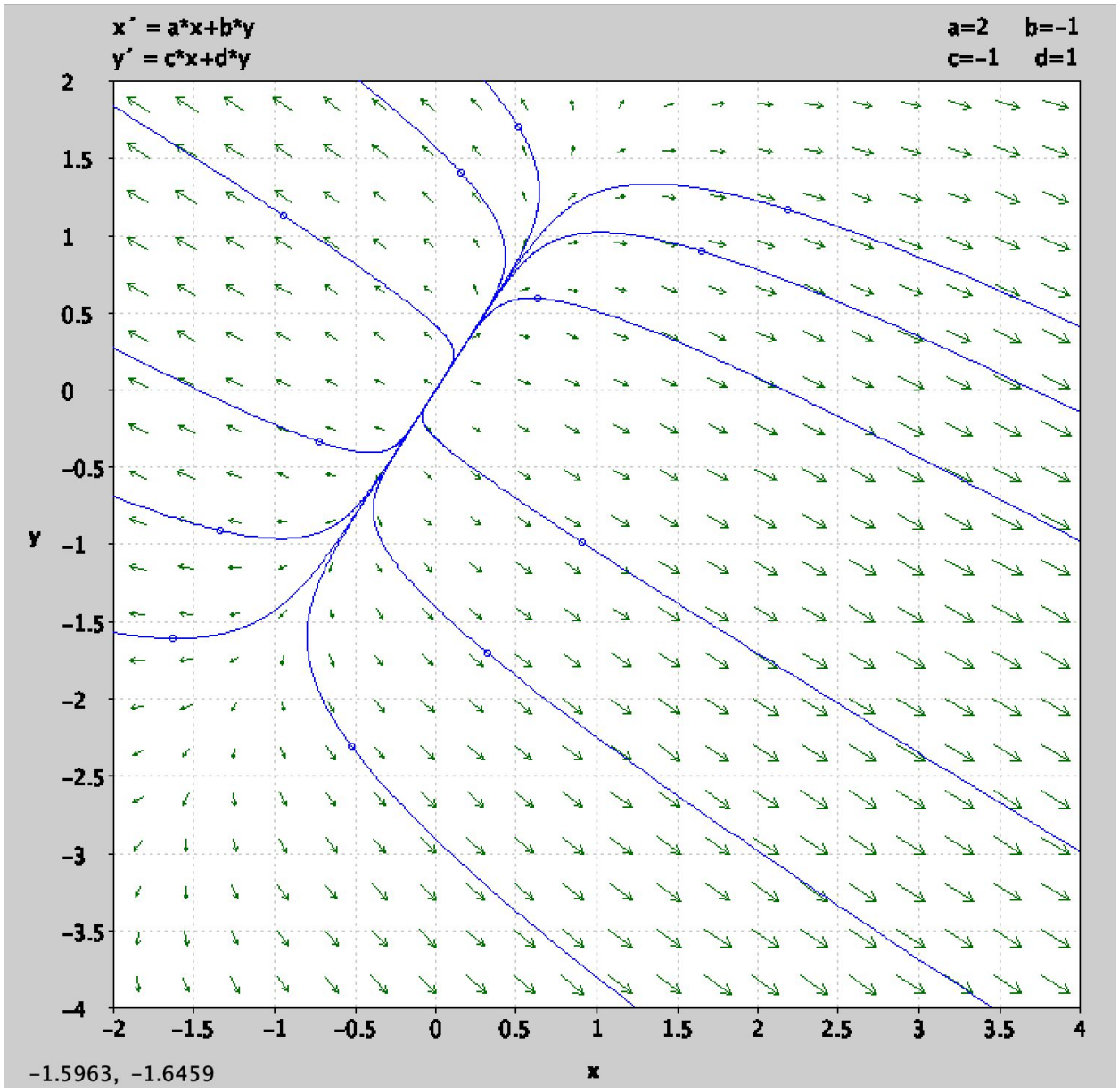
B. We'd guess that Paul's business would grow faster than Bob's. In addition to Paul's business growing twice as fast, as Paul's business is larger, his business will have a greater effect on Bob's business than Bob has on Paul's (because x>y).

C. $\lambda 1 = \frac{-\sqrt{5}+3}{2}$

$\lambda_2 = (\sqrt{5} + 3)/2$

X nullcline -> y = 2x

Y nullcline -> y = x


x′ = a*x+b*y
y′ = c*x+d*y
a=2 b=-1
c=-1 d=1
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
y
-2 -1.5 -1 -0.5 0 0.5 1 1.5 2 2.5 3 3.5 4
x
-1.5963, -1.6459