Mathematics 172

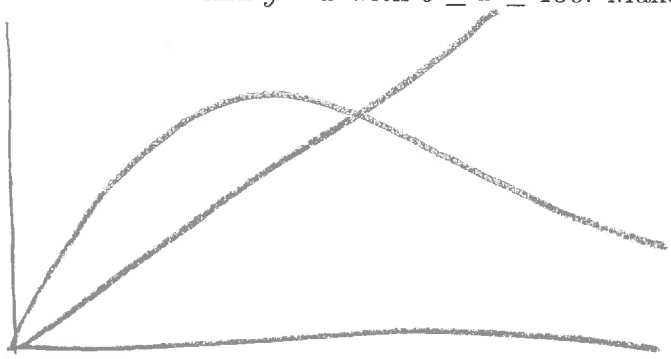
Quiz 10 Name: Key

You must show your work to get full credit.

A population of grasshoppers on a small farm grows by the discrete dynamical system

$$P_{t+1} = P_t e^{1.8\left(1-\frac{P_t}{100}\right)}$$

1. Plot $y = xe^{1.8\left(1-\frac{x}{100}\right)}$ and $y = x$ with $0 \le x \le 150$. Make a sketch of the result here.



2. Find the equilibrium points. Write a sentence or two explaining what you did on your calculator.

Used 2nd calc 5:intersect to find that 100 is eqm pt. That 0 is eqm pt. is clear

Equilibrium points are: 0, 100

3. Use your calculator to compute the following:

dy/dx = slope at smallest equilibrium point. 6.05

dy/dx = slope at largest equilibrium point. -.8

use 2nd calc 6:dy/dx

4. Which, if any, of the equilibrium points are stable?

Stable points are: 100

5. If $P_0 = 110$ estimate the following:

$P_1 \approx$ 91.88

$P_1 = 100\, e^{1.8\left(1-\frac{100}{100}\right)}$

$= 91.88$

(or 2nd calc 0:value)

$P_{78} \approx$ 100

It will converge into the stable point 100