Example 2:

Kentwood, Michigan had a population of 49,000 in the year 2013. The infrastructure of the city allows for a carrying capacity of 60,000 people. $r_{max} = .9$ for Kentwood.

a. Is the current population above or below the carrying capacity? Will the population increase or decrease in the next year?

Below carrying capacity so it should increase next year

b. What will be the **population growth rate** for 2013 (include units)?

$\frac{dN}{dt} = r_{max} N \left(\frac{K-N}{K}\right) = (.9)(49{,}000)\left(\frac{60{,}000-49{,}000}{60{,}000}\right) = 8085$ ppl/yr

c. What will be the **population size** at the start of 2014.

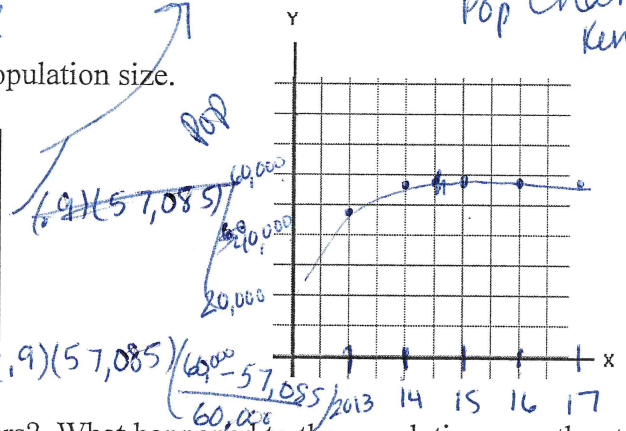
$(.9)(49{,}000)(.18)$

$49{,}000 + 8085 = 57{,}085$ people

d. Fill in the following table. Then graph year vs. population size.

Pop change in Kentwood, Mi over 5 years

Year	Population size	Population growth rate
2013	49,000	8085
2014	57,085	2496
2015	59,581	374
2016	59,955	40
2017	59,996	4



$(.9)(57{,}085)$

$(.9)(57{,}085)\left(\frac{60{,}000-57{,}085}{60{,}000}\right)$

e. What happened to the population size over the years? What happened to the population growth rate over the years?

increased, growth rate decreased as neared carrying capacity

f. Explain your answer from part (e) using what you know about carrying capacity.

As pop. gets closer to carrying capacity the rate of growth slows

g. Explain your answer from part (e) using the formula: $\frac{dN}{dt} = r_{max} N \left(\frac{K-N}{K}\right)$

as the size of pop (N) gets closer to carrying capacity K, then this part gets smaller ↓ pop. growth rate