Mathematics 172 Homework

For the predator-victim system

$$\frac{dV}{dt} = .01V - .002VP$$

$$\frac{dP}{dt} = -.1P + .001VP$$

1. (a) What is the average number of victims? *Answer:* $\widehat{V} = .1/.001 = 100$

(b) What is the average number of predators? *Answer:* $\widehat{P} = .01/.002 = 5$

(c) If we start with 130 victims and 7 predators, what are $V'(0)$ and $P'(0)$? *Answer:* $V'(0) = -.56$, $P'(0) = .21$

(d) Base on your answer to the last question, is V initially increasing or decreasing. Is P initially increasing or decreasing. *Answer:* V is decreasing and P is increasing.

(e) Using the data from part 3 estimate $V(.2)$ and $P(.2)$. Likewise estimate $V(2)$ and $P(2)$. *Answer:*

$$V(.2) \approx V(0) + V'(0).2 = 130 + (-.56)(.2) = 129.888$$
$$P(.2) \approx P(0) + P'(0).2 = 7 + (.21)(.2) = 7.042$$

$$V(2) \approx V(0) + V'(0)2 = 130 + (-.56)(2) = 128.88$$
$$P(2) \approx P(0) + P'(0)2 = 7 + (.21)(2) = 7.42$$

2. What happens to the average number of victims if the death rate, $q = .1$ of the prey is doubled to $q = .2$? and the other constants are kept the same. *Answer:* The new $\widehat{V}$ is $\widehat{V} = .2/.001 = 200$, so it is doubled.