Mathematics 172

Quiz # 30 Name: Key

You must show your work to get full credit.

For the predator-victim system

$$\frac{dV}{dt} = .01V - .002VP \qquad = V(.01 - .002P) = 0$$
$$\frac{dP}{dt} = -.1P + .001VP \qquad = P(-.1 + .001V) = 0$$

1. What are the equilibrium points?

$V = P = 0$

$.01 - .002P = 0 \Rightarrow P = \frac{.01}{.002} = 5 = \hat{P}$

$-.1 + .001V = 0 \quad V = \frac{.1}{.001} = 100 = \hat{V}$

Equilibrium points are (0,0), (100,5)

2. What are the average number of victims and the average number of prey?

$\hat{V} =$ 100

$\hat{P} =$ 5

3. Assume $V(0) = 120$ and $P(0) = 6$ find
(a) $V'(0)$ and $P'(0)$.

$V'(0) =$ −.24 $\qquad P'(0) =$ .12

$V'(0) = 120(.01 - .002(6)) = -.24$

$P'(0) = 6(-.1 + .001(120)) = .12$

(b) Estimate $V(1.5)$ and $P(1.5)$.

$V(1.5) \approx$ 119.64 $\qquad P(1.5) \approx$ 6.18

$V(1.5) \approx V(0) + V'(0)(1.5)$
$= 120 - .24(1.5)$
$= 119.64$

$P(1.5) \approx P(0) + P'(0)1.5$
$= 6 + .12(1.5)$
$= 6.18$