Mathematics 172

Quiz # 31 Name: Key

You must show your work to get full credit.

In this quiz we review the linear approximation to a function. This is

$$f(t+\Delta t) \approx f(t) + f'(t)\Delta t.$$

This is useful when dealing with rate equations as we can approximate the solution. For example if

$$\frac{dN}{dt} = -.01N(20-N)$$

and we know that $N(5) = 15$, then

$$N'(5) = -.01(15)(20-15) = -.75$$

Thus, using $t = 5$ and $\Delta t = .5$ we can estimate $N(5.5)$ as

$$N(5.5) \approx N(5) + N'(5)(.5) = 15 + (-.75)(.5) = 14.625$$

1. V and P satisfy the rate equations

$$\frac{dV}{dt} = .01V(10-P)$$
$$\frac{dP}{dt} = -.005P(50-V)$$

and

$$P(10) = 12, \qquad V(10) = 47$$

then approximate $P(10.5)$ and $V(10.5)$. $V(10.5) \approx$ 46.53

$P(10.5) \approx$ 11.91

$V'(10) = .01(47)(10-12)$
$= -.94$

$P'(10) = -.005(12)(50-47)$
$= -.005(12)(3)$
$= -.18$

$V(10.5) \approx V(10) + V'(10)(.5) = 47 + (-.94)(.5) = 46.53$

$P(10.5) \approx P(10) + P'(10)(.5) = 12 + (-.18)(.5) = 11.91$