

Mathematics 172

Quiz #6

You must show your work to get full credit.

Yeast is growing in a vat that is polluted with alcohol so that the intrinsic growth rate is $r = -.05$ (yeast/hr)/yeast.

1. If yeast is being added to the vat at a rate of 1,000 yeast/hr, then what is the stable population size?

Solution: The basic rate equation is

$$\frac{dN}{dt} = rN + S$$

where $N(t)$ is the number of yeast at time t and S is the rate that yeast is being added to the vat. We know that $r = -.05$ and that $S = 1,000$. At the stable size $\frac{dN}{dt} = 0$. So we get

$$0 = -.05N + 1,000$$

solving for N gives

$$N = \frac{1,000}{.05} = 20,000.$$

2. Still with $r = -.05$, at what rate is the yeast being added to the tank if the stable population size is 3,000?

Solution: This time we know that the stable population size is $N = 3,000$ and we are looking for the stocking rate. Using $\frac{dN}{dt} = 0$ in our basic equation gives

$$0 = -.05(3,000) + S$$

so

$$S = .05(3,000) = 150.$$