

4.3 : Given:  $\frac{dN}{dt} = rN(N-a)\left[1 - \left(\frac{N}{K}\right)\right]$

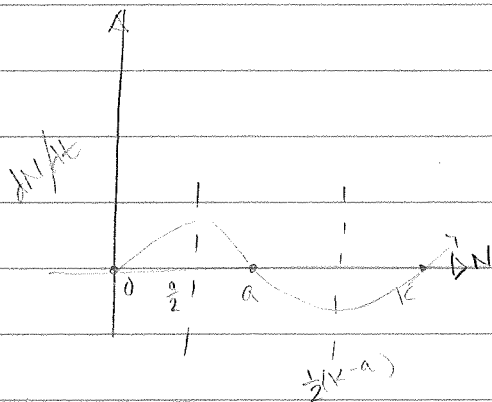
(a) Find the equilibria of the model by setting  $\frac{dN}{dt}$  equal to zero:

$$r\hat{N}(\hat{N}-a)\left[1 - \frac{\hat{N}}{K}\right] = 0$$

This occurs when  $\hat{N} = 0, K, \text{ or } a$

(b)

(c)



Stability occurs:

$$\frac{a}{2} < N < a + \left[\frac{1}{2}(K-a)\right]$$

(d) As opposed to the simple logistic growth model, the model above has multiple equilibria, and doesn't appear to level out at carrying capacity.