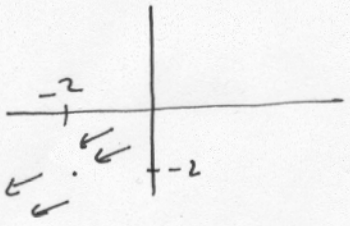
Assignment 32

Supplement

(9) a) $\frac{dx}{dt} = x\left(1 - \frac{1}{2}x - y\right)$; $x = -2$

$\frac{dy}{dt} = y\left(-1 - \frac{1}{2}y + x\right)$; $y = -2$

b)



(13) b) $y\uparrow, \Delta x\uparrow$

$x\uparrow, \Delta y\downarrow$

c) $y\uparrow, \Delta x\uparrow$

$x\uparrow, \Delta y\uparrow$

(14) D

(12) a) $\frac{dc}{dt} = 0.40 \cdot 3 - \frac{c}{5} \cdot 3$

$\ln|2-c| = -\frac{3}{10}t^2 + d$

$c(0) = 1$ $\boxed{c(t) = -e^{-\frac{3}{10}t^2} + 2}$

b) $\frac{dA}{dt} = 0.60 \cdot 3 - \frac{A}{5} \cdot 3$

$A = Be^{-\frac{3}{10}t^2} + 3$

$A(0) = 4$ $\boxed{A(t) = e^{-\frac{3}{10}t^2} + 3}$

(13) a) $\frac{dc}{dt} = \frac{6}{5} - \frac{2}{5}c$

$c = Be^{-\frac{t^2}{5}} + 3$

$c(0) = 1$ $\boxed{c = -2e^{-\frac{t^2}{5}} + 3}$

b) $\frac{dA}{dt} = \frac{9}{5} - \frac{2}{5}A$

$-\frac{1}{2}\ln|9 - 2A| = \frac{t^2}{10} + c$

$A(0) = 4$ $\boxed{A = -\frac{1}{2}e^{-\frac{t^2}{5}} + \frac{9}{2}}$

(15) a) x: prey; y: pred

b) prey will grow; pred will decline

c) $\frac{dx}{dt} = ax - bx^2 - cxy$

$\frac{dy}{dt} = -dy + exy$

$x = \frac{d}{e}$

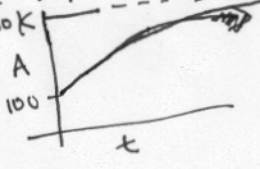
$y = \frac{a}{c} - \frac{bd}{ce}$

$\frac{dx}{dt} = a\frac{d}{e} - b\frac{d^2}{e^2} - c\frac{d^2}{e^2}\cdot\frac{b}{c} - \frac{ad}{e}\cdot\frac{c}{c} = 0$

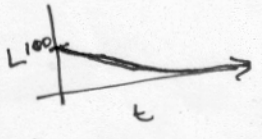
$\frac{dy}{dt} = -\frac{ad}{c} + \frac{bd^2}{ce} + \frac{ad}{c} - \frac{bd^2}{ce} = 0$

d) d, e → involve prey; a, c → involve pred

(17) a) $\frac{dA}{dt} = 100(100000 - 100)$



b) $\frac{dL}{dt} = 100(-1000 - 100)$



c) $\frac{dA}{dt} = A(100000 - A - 50L) = 0$

$\frac{dL}{dt} = L\left(-1000 - L - \frac{A}{25}\right) = 0$

$A = 50{,}000$ $L = 1{,}000$