2005S

Q5

(a) Negative effect of each population on the other.

(b) Eqm solns are $(0,0), (0,17), (10,0), (6,8)$

(c) $$J = \begin{bmatrix} 1-0.2x-0.05y & -.05x \\ -0.15y & 1.7-0.2y-.15x \end{bmatrix}$$

$$J(0,0) = \begin{bmatrix} 1 & 0 \\ 0 & 1.7 \end{bmatrix}$$

This has eigenvalues 1 and 1.7 – there will be a source at $(0,0)$.

$$J(0,17) = \begin{bmatrix} 0.15 & 0 \\ -2.55 & -1.7 \end{bmatrix}$$

Eigenvalues are 0.15 & -1.7, so saddle at $(0,17)$.

$$J(10,0) = \begin{bmatrix} -.1 & -.5 \\ 0 & .2 \end{bmatrix}$$

Eigenvalues are $-.1$ & $.2$, saddle at $(10,0)$

$$J(6,8) = \begin{bmatrix} -.6 & -.3 \\ -1.2 & -.8 \end{bmatrix}$$

Eigenvalues are $-.0917, -1.3083$, so sink at 6.8

(d) See next page

(e) Start at $(10,4)$ on phase portrait

x population decreases & tends to 6000

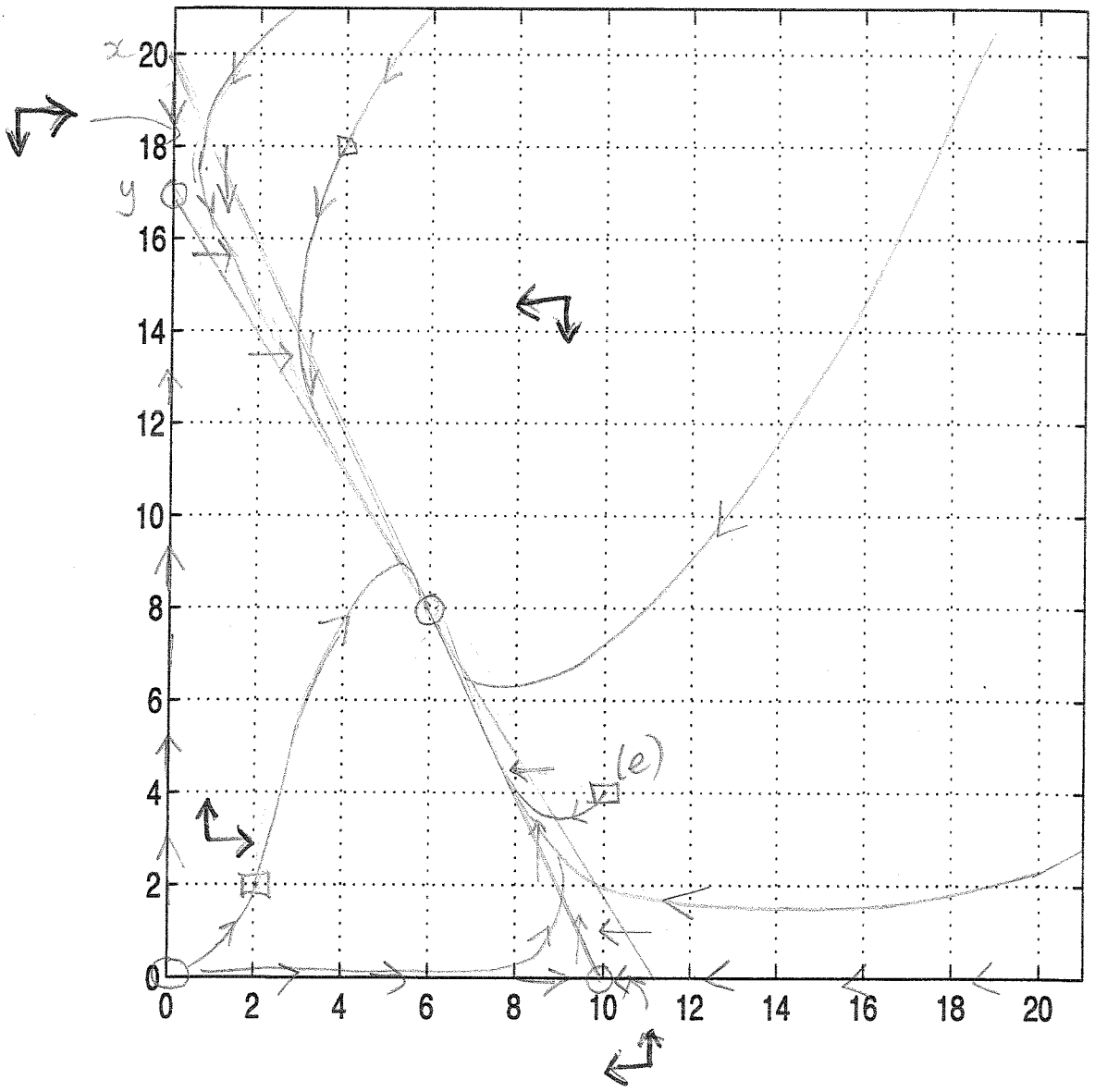
y population decreases for a while & then increases & tends to 8000.

Candidate's Name: _____ ID No: _____

TIE THIS ANSWER SHEET TO YOUR SCRIPT BOOK

055

Answer sheet for Question 5(d)



Check on plane. _____