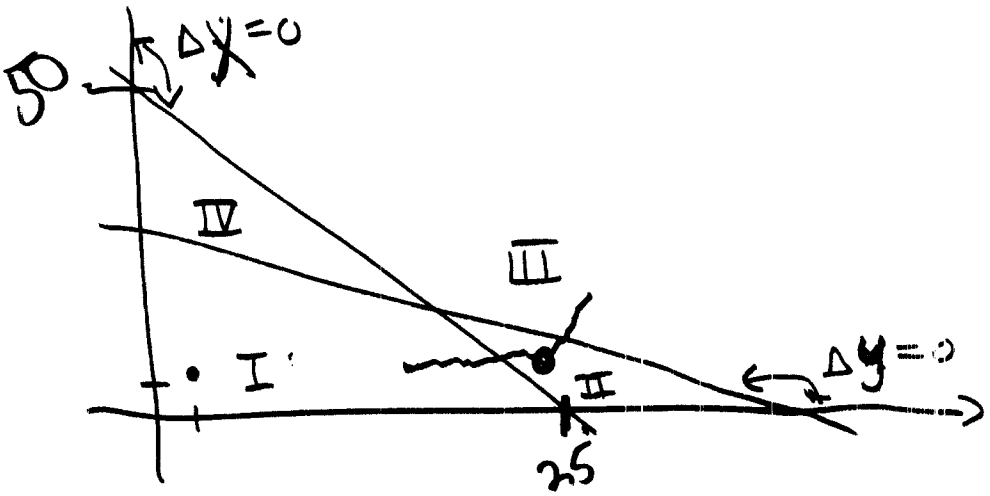
11-3-05

HW Ch 7 Due 3 PM tomorrow
C1 312

1st draft of phase plane



I $\Delta X > 0$, $\Delta y < 0$

II I→II Cross $\Delta X = 0$ so $\Delta X \leq 0$ (switched) $\Delta y < 0$ (same)

III (II→III cross $\Delta y = 0$) $\Delta X < 0$ (same) $\Delta y > 0$ (switch)

IV

How to graph lines $\frac{\Delta X}{\Delta t} = .5X - .01Xy - .02X^2$

Graph $\Delta X = 0$

① Factor: $X = 0$ (↑ y-axis) , $.5 - .01y - .02X = 0$

② Find lines

x	0	$\frac{.5}{.02} = 25$
y	$\frac{.5}{.01} = 50$	0

Measles

Susceptible Infected Recovered

(I) Groups Compartments

(II) Movement Group to Group Arrows

(III) Movement count # moving

Write Equations for

A. Put into Excel - Visually Inspect. Make Predictions

B. ~~Chg~~ Adapt Model to other diseases - New Groups, Arrows

C. Wring out observations from Algebra

$$\frac{\Delta S}{\Delta t} = -aSI$$

$$\frac{\Delta I}{\Delta t} = +aSI - bI$$

$$\frac{\Delta R}{\Delta t} = +bI$$

Each Arrow $\leftrightarrow$ 2 terms
One +, tip
One -, tail

$$a = \frac{\#\text{ contacts/day} \cdot \text{chance inf/contact}}{\text{Total Pop.}}$$

$$b = \frac{1}{\text{recovery time}}$$

Can we predict when $\Delta I = 0$

$$\frac{\Delta I}{\Delta t} = aSI - bI = 0$$

$$(aS - b)I = 0$$

$$aS - b = 0 \qquad I = 0$$

$$S = \frac{b}{a}$$

$$S = \frac{\text{Total Pop}}{\text{recovery time} \cdot \text{contacts} \cdot \text{ch.inf.}}$$

$$\Delta I < 0$$

$$(aS - b)\, I < 0$$

$$aS - b < 0 \quad \& \quad I > 0$$

$$aS < b$$

$$S < \frac{b}{a} = \text{Threshold population}$$

Book example $\longrightarrow$ $= \frac{.125}{.0018} \approx 69$

$=$

For I to decrease, need

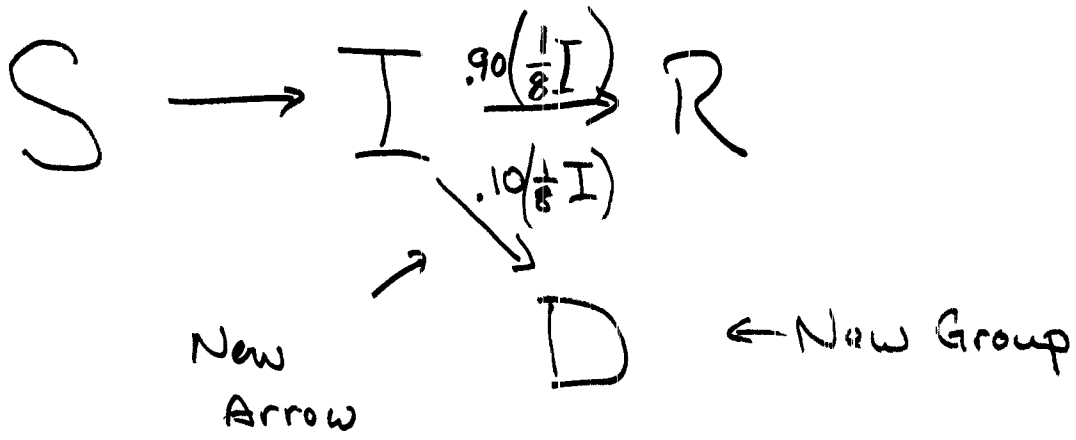
$$S < \text{Threshhold} = \frac{\text{Total Pop}}{\text{recovery time} \cdot \#\text{cont.} \cdot \text{Chinf.}}$$

Wait until S decreases or increase Threshold

Decrease { # contacts/[redacted] $\rightarrow$ increase Threshold
Chance infection/contact

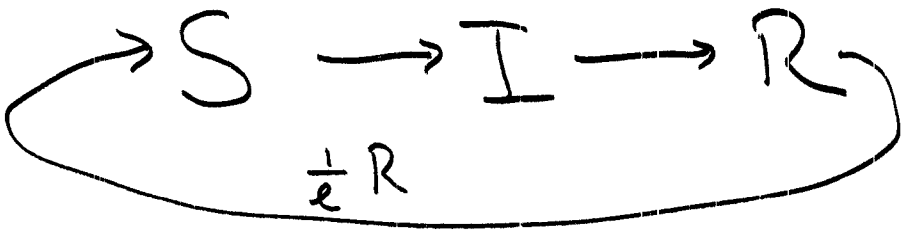
Change Model

-Suppose Measles is Sometimes fatal



Suppose after 8 days 90% Recover in I
10% Die.

- Model for Common Cold



ℓ = time to lose immunity

~~put b/c~~ ~~2, 3, 4, 5~~

Ch 8 HW 2 ~~a,b,c~~, ~~3 a,b,d~~, ~~4, 5~~

Due Next Fri 2a, ~~b~~ 3ad 4 5