

2.3 #1

12/3
①

$$\frac{dy}{dx} = a y (b - y)$$

$$y(0) = 35$$

$$\rightarrow y(1) = 700$$

$$b = 35,000$$

$$y(x) = \frac{b y_0}{(b - y_0) e^{-a b x} + y_0}$$

a unknown

$$y_0 = y(0) \\ = 35$$

$$700 = \frac{35,000 \times 35}{(35,000 - 35) e^{-a \cdot 35,000} + 35}$$

$$y(x) = .9 \times 35,000$$

Solve for x

2.3
H 3

10/3
②

$$y' = a y (b - y) \leftarrow$$

$$y(x) = \frac{f}{u(x)}$$

$$y'(x) = \frac{-1}{u(x)^2} u'(x)$$

$$-\frac{1}{u(x)^2} u'(x) = a \frac{f}{u(x)} (b - \frac{f}{u(x)})$$

$$-u' = a (b u - f)$$

$$u' = a (f - b u)$$

$$\frac{du}{dx} = a (f - b u)$$

$$\frac{du}{f - b u} = a dx$$

$$-\frac{1}{b} \ln |f - b u| = a x + C$$

~~11/2~~

2.3 #7

10/3
③

$$\frac{dy}{dx} = \frac{1}{2} (1-y)^2$$

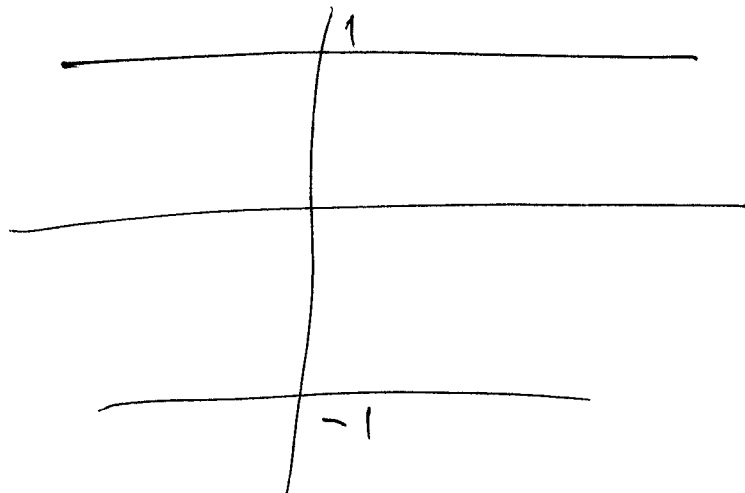
$$2 \frac{dy}{1-y^2} = dx$$

$$\int 2 \frac{dy}{1-y^2} = \int 2 \frac{dy}{(1-y)(1+y)}$$

$$= \int \left(\frac{A}{1-y} + \frac{B}{1+y} \right) dy$$

$$= \int \left(\frac{1}{1-y} + \frac{1}{1+y} \right) dy$$

$$\text{On } \frac{1+y}{1-y} = x + C$$



2.4
6

$$\frac{dy}{dx} = a y (b - y)$$

10/3
(4)

$$y(x) = \frac{by_0}{(b-y_0)e^{-abx} + y_0}$$

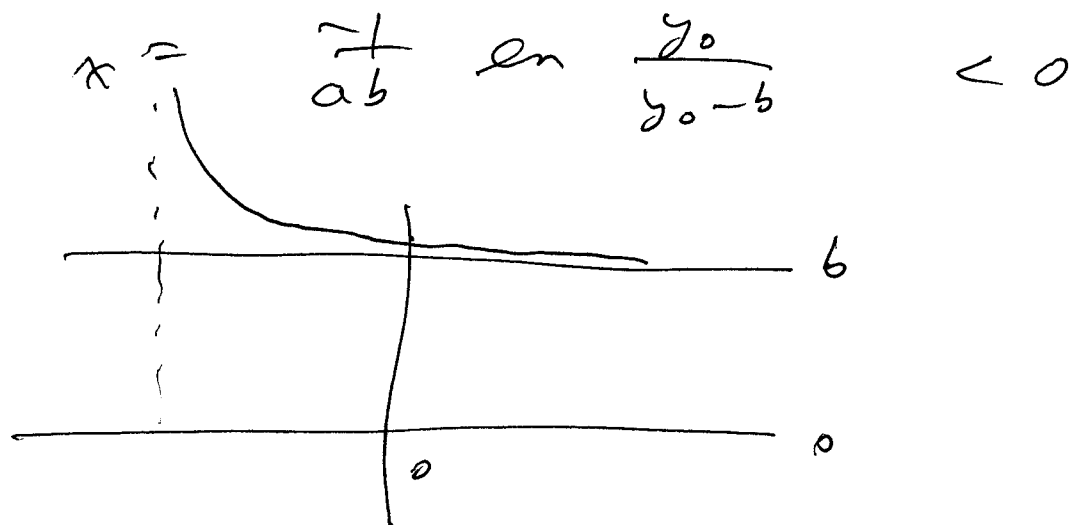
Suppose $y_0 > b$

$$(b - y_0)e^{-abx} + y_0 = 0$$

$$e^{-abx} = \frac{-y_0}{b - y_0}$$

$$= \frac{y_0}{y_0 - b} > 1$$

$$-abx = \ln \frac{y_0}{y_0 - b} > 0$$

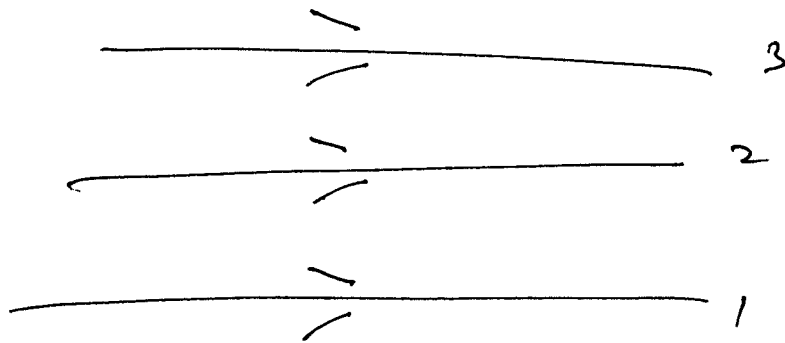


2.4
⑨ ⑨

11/2/3 ⑤

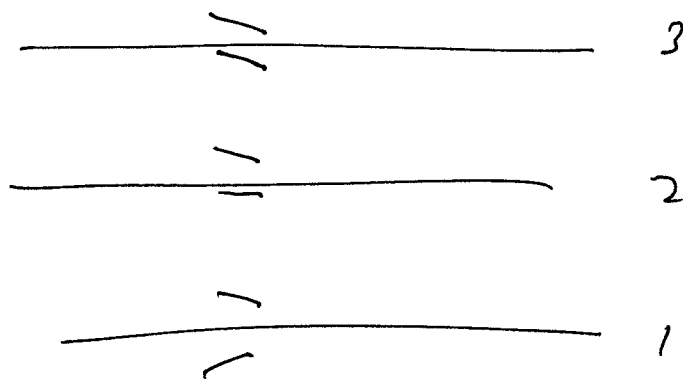
$y = 1, 2, 3$ all

stable

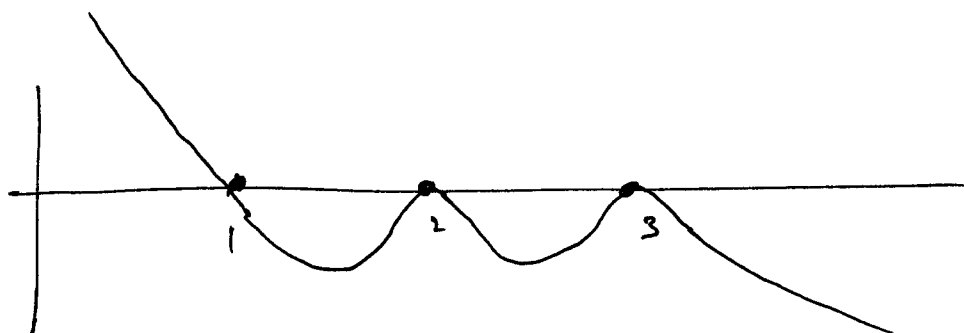


⑨

1 stable
2, 3 removable



$$(y-1)(y-2)^2(y-3)^2$$



$f(y)$

PDF Problem

12/3
6

$$\frac{dy}{dx} = ay(b-y) - c$$

$$aby - ay^2 - c = 0$$

$$-ay^2 + aby - c = 0$$

$$\frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$\frac{-ab \pm \sqrt{a^2b^2 - 4(-a)(-c)}}{2(-a)}$$

$$\frac{ab \pm \sqrt{a^2b^2 - 4ac}}{2a}$$

two equi. if $a^2b^2 - 4ac > 0$
no equi. if $a^2b^2 - 4ac < 0$

$$a^2b^2 = 4ac$$
$$c = \frac{a^2b^2}{4a} = \frac{ab^2}{4}$$

