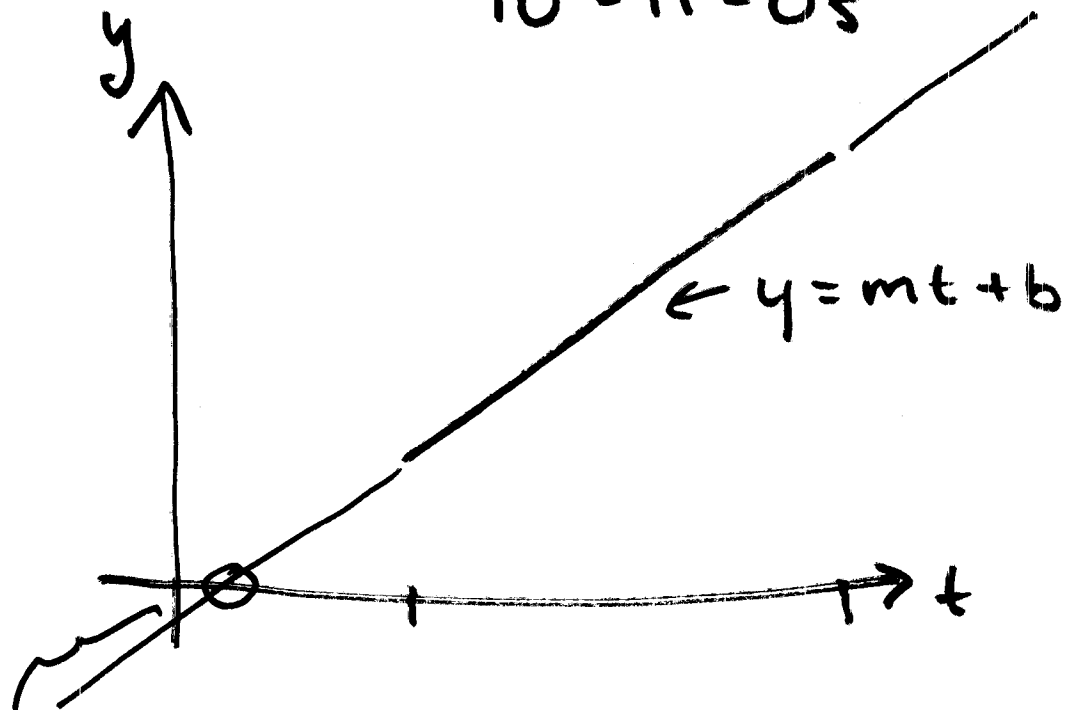


10-11-05

①



Usually y represents
some quantity that must be positive
Where line meets t -axis is t -intercept
 $\Leftrightarrow y=0$

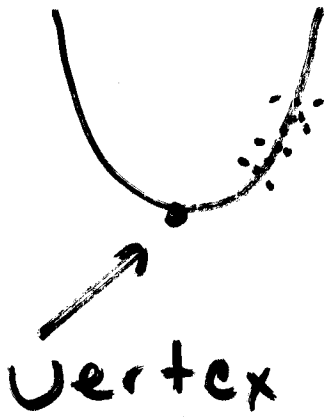
$$0 = mt + b$$

$$-\frac{b}{m} = t$$

Maybe t -intercept is way outside
possible t -values ± 200 yrs

Maybe the model $y = mt + b$
predicts $y=0$ when it isn't
reasonable. ± 10 yrs

Parabola



$$y = at^2 + bt + c$$

Vertex is at $t = -\frac{b}{2a}$.

If $t = -b/2a$ is near t -values for data, this could ~~give~~ mean the model calls for decreases & increases

If $t = -b/2a$ is far from t -values for data, can ignore the vertex & focus on arc

Sri Lanka

In 1850 there were

$$\frac{25 \text{ births}}{1000 \text{ population}} = 2.5\% \text{ birth rate}$$

$$\frac{17 \text{ deaths}}{1000 \text{ population}} = 1.7\% \text{ death rate}$$

$$.8\% \text{ growth rate}$$

$$\text{growth} = +\text{Births} - \text{deaths}$$

1850 ~ 1910

birth rate \approx death rate

So growth rate stays small

1910 - 1950

High birth rate

Death rate drops

Growth rate goes up.

1950 - 2000

Birth rate drops significantly

Death rate stays lower, drops
even more.

So Growth rate falls.

Demographic Transition (Stages I-III)

Stage I characterized by high birth
death rates & low growth.

Typical of pre-industrial, agricultural
society.

Why high birth rate?

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- kids needed for labor
- No birth control
- lack of education.
- high child mortality

Why death rate?

- No modern medicine.
- No sanitation, clean drinking water.

Stage II Early Industrial Society

Why birth rate high?

No birth control
good food supply

Kids still used as economic resource

Why high death lowering .

- Medicine
- Sanitary living conditions

Stage III Late Industrial / Post Indus⁶

Birth rate drops - Why?

Birth Control

Kids no longer an economic asset

Instead, they are expensive.

Women more educated,
career oriented

Death rate remains low.

Growth ~~close~~ to small
but never 0.

Phillippines (p 127)

Birth rate High

Death rate Falling

This typifies Stage II in a D.T.

Japan Now Stage 3

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Stage 1 through 1925 when death rate starts to fall

Stage 2 through WW II
when birth rates start to fall

Logistic Model from description:

$$\frac{\Delta y}{\Delta t} = r \cdot y \cdot \left(1 - \frac{y}{L}\right)$$

y = # school children in Indonesia

t = yrs (no specific start value)

r = early exponential growth rate

L = carrying capacity

P130 #3

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Where will the US pop level off?

$$\frac{\Delta y}{\Delta t} = .03134y - 1.5887 \times 10^{-10}y^2$$

$$\frac{\Delta y}{\Delta t} = a \cdot y - b \cdot y^2$$

$$\Downarrow \quad a = r \quad L = \frac{a}{b} \quad (\text{p 120})$$

$$\frac{\Delta y}{\Delta t} = r y \cdot (1 - y/L)$$

$$= .03134y \cdot (1 - \frac{y}{L})$$

$$L = \frac{.03134}{1.5887 \times 10^{-10}}$$

$$= 197,268,206.7$$

$$\approx 197 \text{ million!}$$