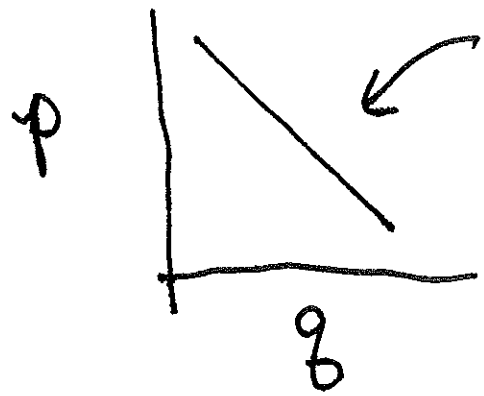
29 Sept 09

HW #1 DUE NO LATER THAN
8AM MON OCT 5



Demand curve

p_0 p_1

$$p = a - b \cdot q$$

Units

Dollars

Dollars

items

units of $b \cdot q$ = Dollars

$\frac{\text{Dollars}}{\text{item}}$

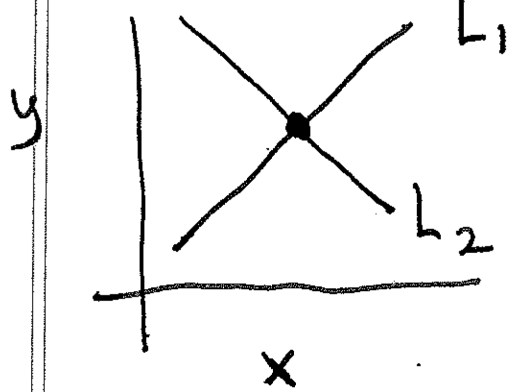
$$R(q) = p(q) \cdot q = q(a - bq)$$

§ 3.4

$L_1 \qquad a_1 x + b_1 y = c_1 \qquad a, b, c \sim \text{numbers}$

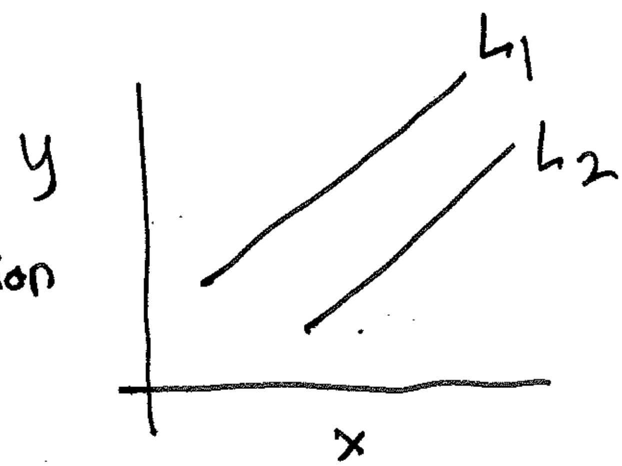
$L_2 \qquad a_2 x + b_2 y = c_2$

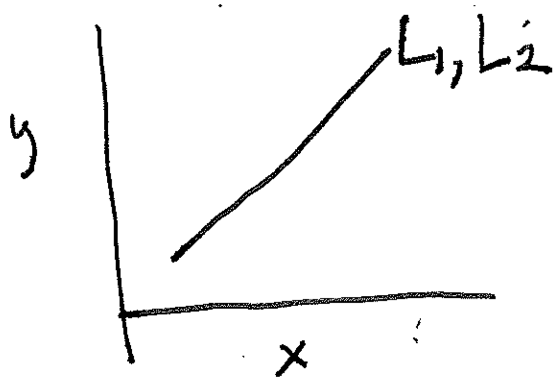
2 eqns for 2 unknowns



one solution

no solution





infinitely many solutions

Finding x & y

① By adding/subtracting to get rid of x or y $\Rightarrow$ 1 eqn in 1 unknown

② Find y in terms of x from line L_1, say substitute into line L_2

$$a_1 x + b_1 y = c_1 \Rightarrow y = \frac{1}{b_1}\left[c_1 - a_1 x\right]$$

Q When are there infinitely many solutions?

A When L_1 = multiple of L_2

§ 3.5 Nonlinear Systems

Example $x^2 - 5x + y = 6$

$x + y = 1$ Dutt, $y = 1 - x$

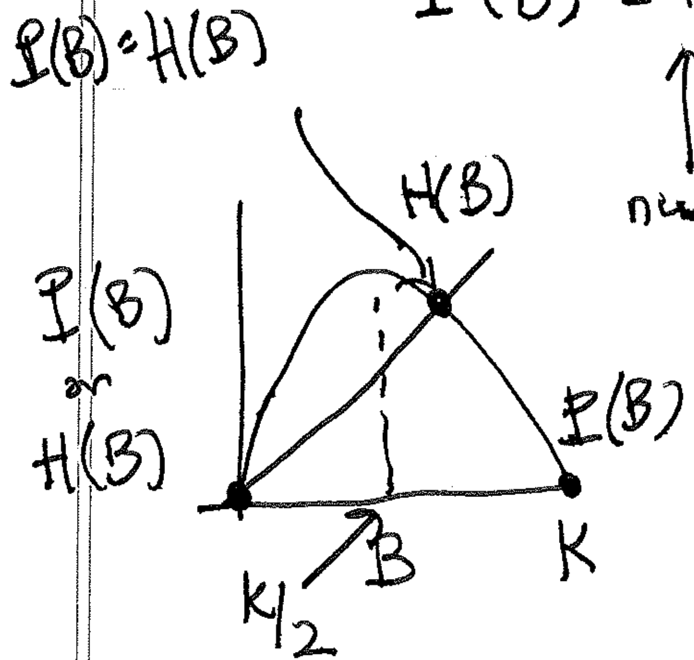
so $x^2 - 5x + 1 - x = 6$

Fishery economics

Annual production of sardines when the sardine biomass [tons] is B is

$$P(B) = rB\left(1 - \frac{B}{K}\right) = rB - \frac{rB^2}{K}$$

numbers



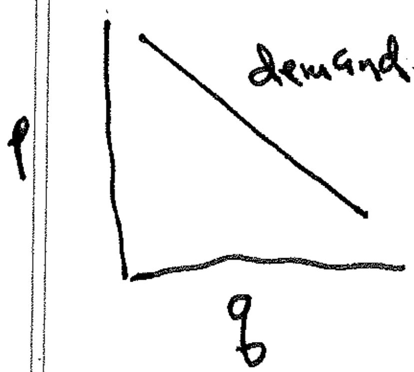
Harvest $= H(B) = cEB$

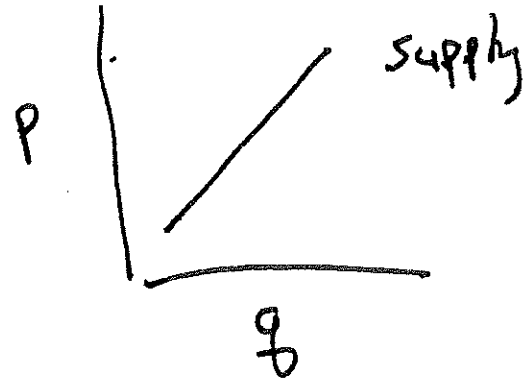
constant

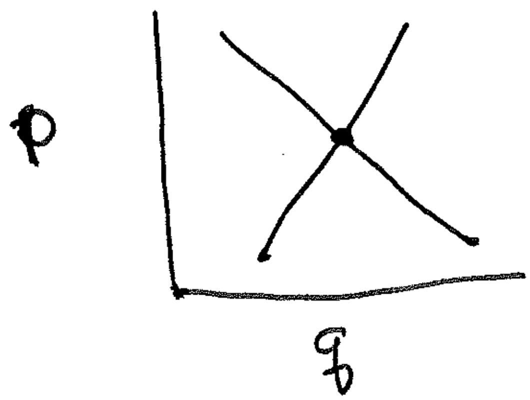
fishing effort

§ 3.6 - OTHER APPILATIONS

↑ Your job → read this section

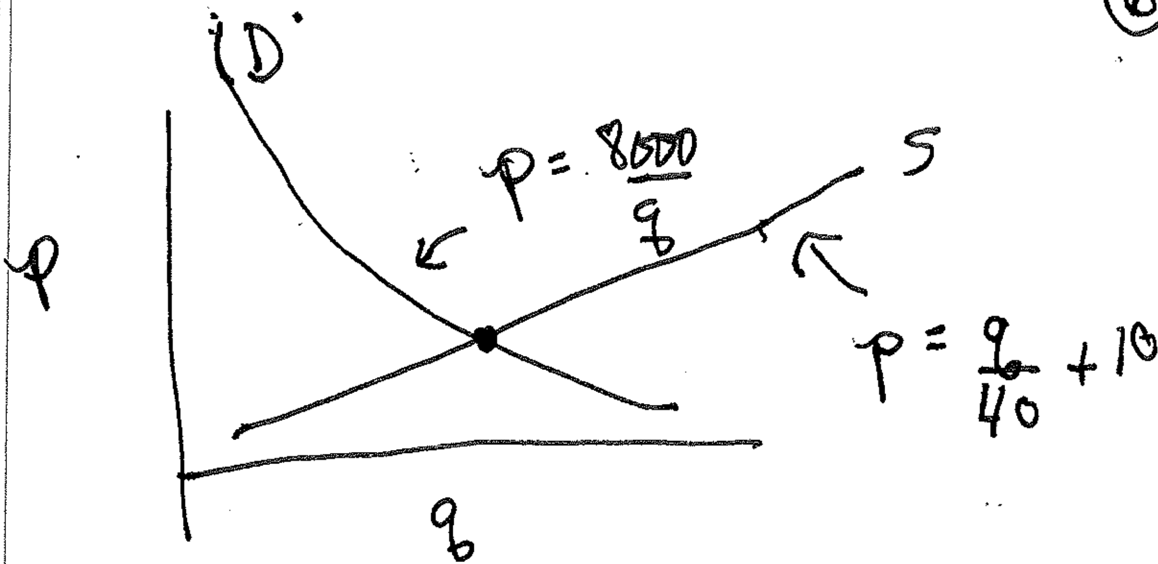






Are these always linear? — No.

Neal Stephenson



$$\frac{8000}{q} = \frac{q}{40} + 10$$

$$8000 = \frac{q^2}{40} + 10q$$

$$\boxed{\text{READ PGS } 39\text{-}42}$$

§4.1 Review: Exponents and Logs.

$$f(x) = b^x$$ exponential function with base $b>0$

b ← constant

Rules for exponents $a>0$ number, m,n numbers

$$a^m a^n = a^{m+n}$$

This is $\underbrace{a \cdot a \cdot a \cdots a}_{m \text{ times}}$

$$a^0 = 1$$

$$a^1 = a$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$(ab)^n = a^n b^n$$

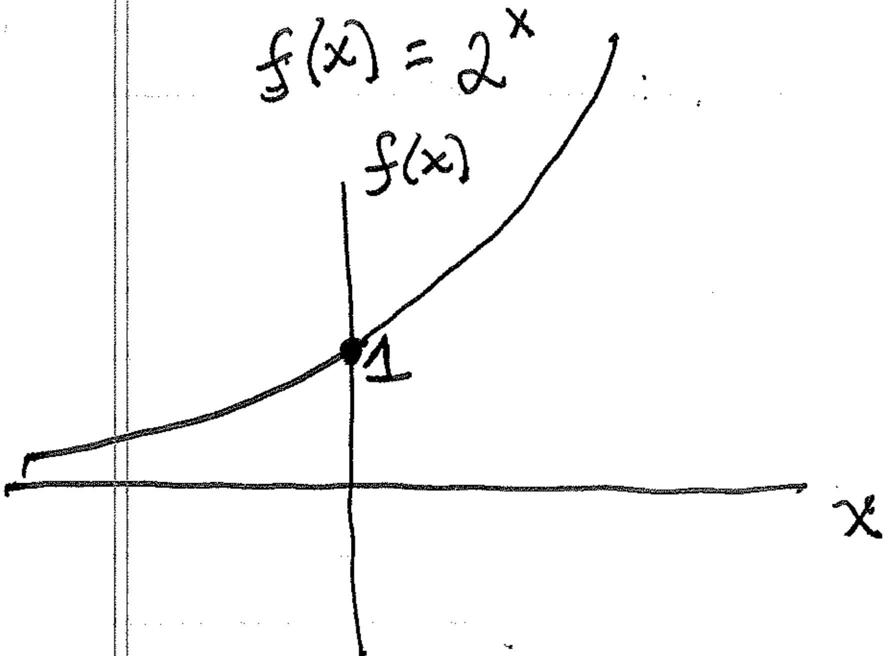
"Eh to the En times Bee to the En"

$$(a^m)^n = a^{mn}$$

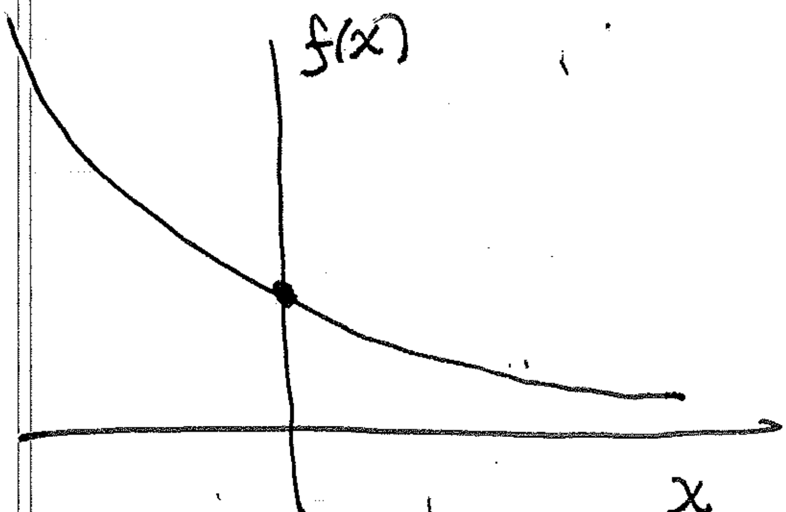
$$(a/b)^n = a^n/b^n$$

$$\left(\frac{a}{b}\right)^n = \underbrace{\frac{a}{b} \cdot \frac{a}{b} \cdots \frac{a}{b}}_{n \text{ times}} = \frac{a^n}{b^n}$$

$f(x) = 2^x$



$f(x) = 2^{-x} = 1/2^x$



Application: Interest Accumulation

P = principle invested

r = rate of interest [annual]

$A(n)$ = Accumulated value ~~a~~ ~~years~~ n periods in the future

$$A(n) = P\cdot(1+r)^n$$

To begin suppose $r=1$

After one year $A = P(1+1)^1 = P\cdot 2$

After 2 6 month periods $A = P\underbrace{\left(1+\frac{1}{2}\right)}_{\text{value after 6 months}}\left(1+\frac{1}{2}\right) = P\cdot(1.5)^2 = P\cdot(2.25)$

After 3 4 mont ~~quarterly~~ periods $A = P\overbrace{\left(1+\frac{1}{3}\right)}^{\text{after first trimester}}\left(1+\frac{1}{3}\right)\left(1+\frac{1}{3}\right)$

$= P\cdot(1.333)^3$

$= P\cdot 2.37$

$\frac{n}{n}$

Many periods $A = P\left(1+\frac{1}{n}\right)^n = P\left(\frac{n+1}{n}\right)^n$

As n gets larger & larger

$$\left(1+\frac{1}{n}\right)^n = \left(\frac{n+1}{n}\right)^n$$

gets closer and closer to a <u>special</u> number

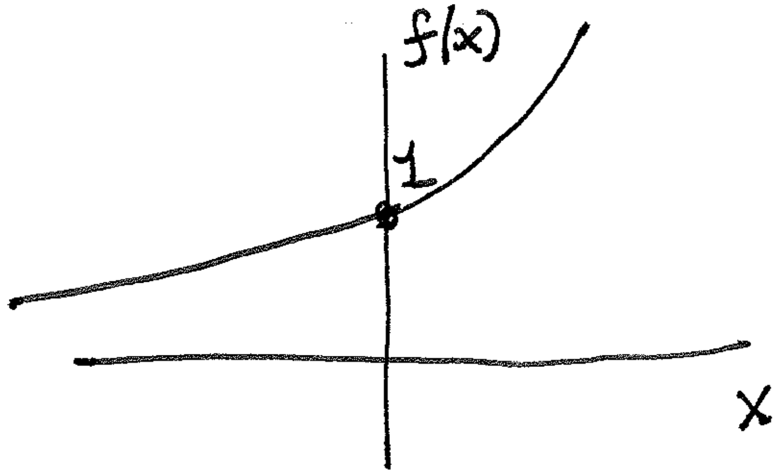
$$e = 2.71828\ldots$$

goes on forever

<u>Napier</u>

$f(x) = e^x$

a very special function



§4.2 Logarithmic Functions

$$y = b^x$$

$$\Updownarrow$$

$$x = \log_b y$$

x is the number that b is raised to in order to obtain y