Functions
"Def" p.2

A function is a rule (?in) which assigns to each object in a set A (called domain of f) exactly one object in a set B (called range)

N.B. — ~~range may be~~ Content – Range {exactly all objects assigned & Maybe bigger
— Real nos

Convention: if not specified otherwise assumed to be all the nos for which defn/rule makes sense

e.g. $y = \sqrt{x-1}$ domain $\{x \mid x \geq 1\}$

$f(t) = \frac{1}{t}$ domain $\{all\ t \neq 0\}$

(i.e.) don't try sqrt(neg) divide by 0.

Compositions. $G(q) = (80-q)^2 q$

$= f(g(q))$ $g(q) = 80-q$

$f(\cdot) = (\cdot)^2$ (?)

Example 1.1.5:

p = price per item

q, x = number of units (q demanded nee quantity x)

(produced, sold)

– consumers demand "x" [thousand] when p = unit price

$p = 51 - 0.27x$ ← function

← practical domain for able $x > 0$ and $51 - 0.27x > 0$

$x < \frac{51}{.27} \approx 188$

Cost of producing x th

$C(x) = 2.23x^2 + 3.5x + 85$ thousand dollars

$P(x)$ $(D(q))$ demand

$R(x) =$ price/unit $\cdot$ no. units $(R(q))$ Revenue function

$P(x) =$ ~~profit~~ $R(x) - C(x)$ $(P(q))$

Same concepts x thousand [units]

p dollars

C thousand $

(a) $D(x) = -0.27x + 51$

$R(x) = (-0.27x + 51) \cdot x$ thousand dollars

dollars/unit · thousand units

~~$C(x) = (-0.27x + 51 \cdot x) - 0.27x + 51$~~ cost

~~$P(x) = 2.5x^2 + 3.5x + 85$~~

thousand $

(b) Profitable when $P(x) > 0$

$P(x) = -2.5x^2 + 47.5x - 85$

Get $\boxed{P(x) > 0}$ $= \ldots -2.5(x-2)(x-17)$

How? Quadratic Formula / Get Lucky Factor / Graph

Profitable for $2 < x < 17$

Example 1.1.10 Total Cost

Cost $C(q)$

Total cost of manufacturing the first q units of "certain commodity"

e.g. $C(q) = q^3 - 30q^2 + 500q + \underbrace{200}_{\text{startup cost}}$

Realistic? Probably not.

cost of producing 11th: $C(10) - C(9)$

[Estimate: $C(10+\frac{1}{2}) - C(10-\frac{1}{2})$ [Later]]

Compositions. Practice 1.1. Prob 53

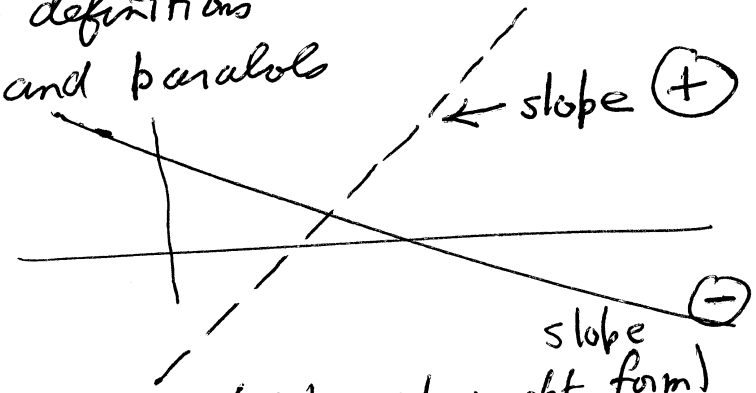
$\frac{f(x+h) - f(x)}{h}$ } difference quotient

$f(x) = \frac{1}{x}$:

Graphs: Visualize with calculator

Piecewise definitions

Lines and parabolas



Line

- $Ax + B$ (slope intercept form)

Point slope form:

2009 01 #2
~~Slope~~ 4/4.

Commuter train has 12000 riders/day
fare is $5. For each .10 increase in fare
~~loose~~ approx 300 riders.
Find a formula for
(1) Total number of riders at fare $f(p)$
(2) Revenue with fare at p.
slope/rate of change

$$= \frac{-300 \text{ riders}}{.10\ \$}$$

$$Q = 12000 - \frac{300}{.10}(p - 5.00)$$

check units!