* 1.6 #43 (Postage Stamp
2.1 #37, #43

p.77 A fn f is continuous at c if
$f(x)$ at $x=c$

a) $f(c)$ ✓
b) $\lim_{x\to c} f(c)$ exists ✓
c) $\lim_{x\to c} f(x) = f(c)$

Nice Formulas (Not piecewise, ÷0, ...) are continuous at c for every c "f is continuous"
One sided Stock Price Example 1.3.23.c $60 \nearrow 25$ (1yr) | $25 \searrow 5$ (3mo) | $5 \nearrow 12$ (9mo)

Continuous except at special pt
Ex. 1.6.6.b $g(x) = \frac{x^2-1}{x+1}$, $x \neq -1$
Continuous at c (x) except $x=-1$ where not defined
(In this case $\frac{x^2-1}{x+1} = \frac{(x-1)\cancel{(x+1)}}{\cancel{x+1}}$ has limit at 1.
New function $\tilde{g}(x) = \begin{cases} \frac{x^2-1}{x+1}, & x \neq 1 \\ -2 \end{cases}$ Continuous also at 1

Language: Cont. on an interval p.79
On I continuous at every point not an endpoint
If end [a, b] is included Cont on I
– f(a) is def
– $\lim_{x \to a^{\circ}} f(x) = f(a)$
(correct side)

(Ex) $f(x) = \sqrt{x}$, $x \geq 0$
"Continuous on $x \geq 0$" (At 0 lim does not in full blown sense

(Limits @ ∞)
Notation p.102 h, Δx, Δt, ...

Example of "infinite limit" 20090123 2/

$f(x) = \frac{1}{x-1}$ good formula $x \neq 1$

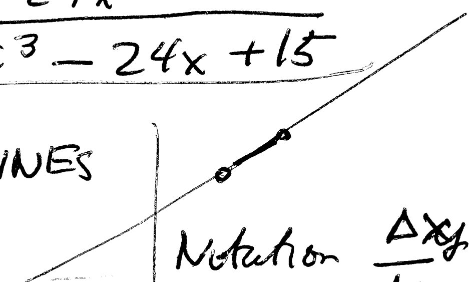
Graph: $\lim_{x \to 1^+} \frac{1}{x-1} = +\infty$

~~means f(x) is very large and pos~~ if

for x near 1, (right side), f(x) is very large

[full blow

(?) later $\lim_{x \to +\infty} \frac{x^3 + 24x - 15}{16.3x^3 - 24x + 15}$



DERIVATIVE GEOMETRY LINES

Rate of Change Ratio $\frac{\text{changes } f(x)}{\text{change in } x}$ lines

Notation $\frac{\Delta y}{\Delta x}$ $\left[\frac{\Delta f}{\Delta x}\right]$

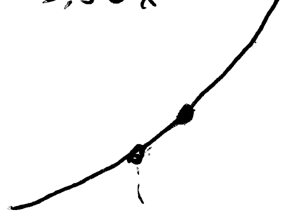
Example Cost of producing "x" items is

$C(x) = \sout{4000}\ 40 + 3.50x$

Line slope 3.5 Rate of change $\frac{(4+3.50(x+\Delta x)) - (4+3.50x)}{\Delta x}$

$= \ldots = \frac{3.50\,\Delta x}{\Delta x} = 3.50x$ = cost per unit

Also for not line (BIG PICTURE almost line



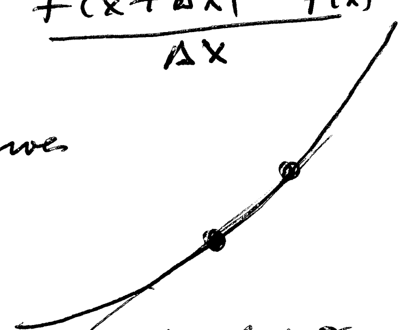
Avg rate of change [of "y"] as x changes from x to $x + \Delta x$ [allow negative] $\frac{\Delta y}{\Delta x} = \frac{f(x+\Delta x) - f(x)}{\Delta x}$

(Use h instead of Δx??)

LINES: $\Delta x\ [h] \neq 0$

constant

"Curves



— Changes depends on x

Fixing x, changes in [illegible]

Derivative: f function [f(x)]

Fix a c. $\lim_{h \to 0} \frac{f(c+h) - f(c)}{h} \equiv f'(c)$

"f-prime of c", derivative of f [at c]

(usually depends on c)

Formula: x^2 ; More tricky $\sqrt{x}$, $x > 0$

First formulas

$f'(x)$ is the function defined by

$$x \longrightarrow \boxed{\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}} \longrightarrow f'(x)$$

$y = x^2$ $f'(x) = 2x$ (all x)

Limit rules for sums: ~~Products~~

$f(x) = x^2$ $f'(x) = 2x$ Note on domain (all x)

$$\frac{dy}{dx} = \lim_{x \to 0} \frac{\Delta y}{\Delta x}$$

INC near c $f'(c) > 0$

(No hope for lim as f not cont near c