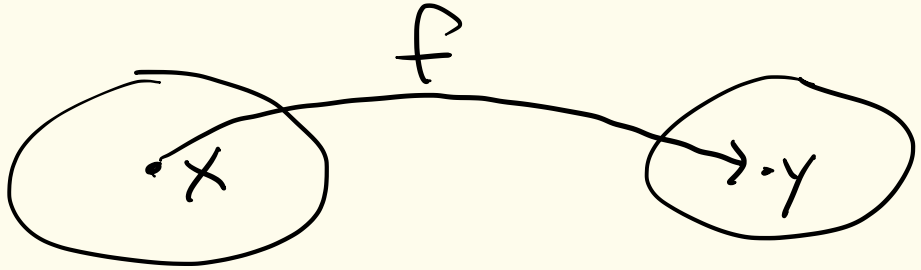
1.1 Functions

Defn: A FUNCTION is a rule that takes numbers as inputs (domain) and assigns to each a unique output (range)



Domain

x - independent variable

Range

y - dependent variable

Continuous vs. Discrete Functions

Ex: $y = f(x) = \sqrt{x} = x^{1/2}$

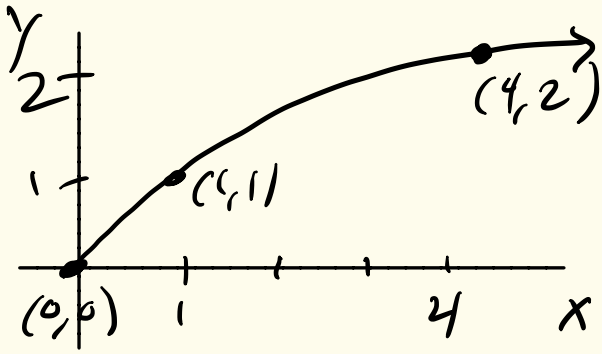
0 is included

x	y
0	0
1	1
4	2
5	$\sqrt{5}$

Domain: $[0, \infty)$

↑ closed

Range: $[0, \infty)$



CONTINUOUS

Discrete Case: Daily Low Temperature
Int. Falls MN 12/17-26 2008

TABLE

Date	17	18	19	20	21	22	23	24	25	26
Temp (F°)	-14	-15	-12	-4	-15	-18	1	-9	-10	-16

Domain = {17, 18, 19, 20, 21, 22, 23, 24, 25, 26}

Range = {-16, -15, -14, -18, -12, -19, -9, 1, -4}

CDs!

- starts

How much data?

Each second!

((2) 14 bit 2 bit) 44,100 per second

(2) ↑ L+R

14 bit: music

2 bit: error

80 minutes of music

Calculate to see how much data is on a CD.

Interval notation

$[a, b]$ = set of numbers such that $a \leq x \leq b$

(a, b) = " " " " " $a < x < b$

$[a, b)$ = " " " " " $a \leq x < b$

$(a, b]$ = " " " " " $a < x \leq b$

∞: (a, ∞) $\quad (-\infty, a)$

$[a, \infty)$ $\quad (-\infty, a]$

Function Notation: $y = F(t)$

y: independent variable

F: function

t: dependent variable

$\Delta = G(\odot)$

$George = HELLO(\$)$

Ex: $V = g(a)$ V - value of a car in $1000.00

a - age of car in years

$g(5) = 9$ $\Rightarrow$ After 5 yrs the car is worth $9K

Suppose $g(a) = 13.78 - 0.8a$ LINEAR

$g(0) = 13.78 - 0.8 \cdot (0)$

$= 13.78$

$a = 0$ $\Rightarrow$ new car

Question: when is the value of the car 0?

answer $\Rightarrow$

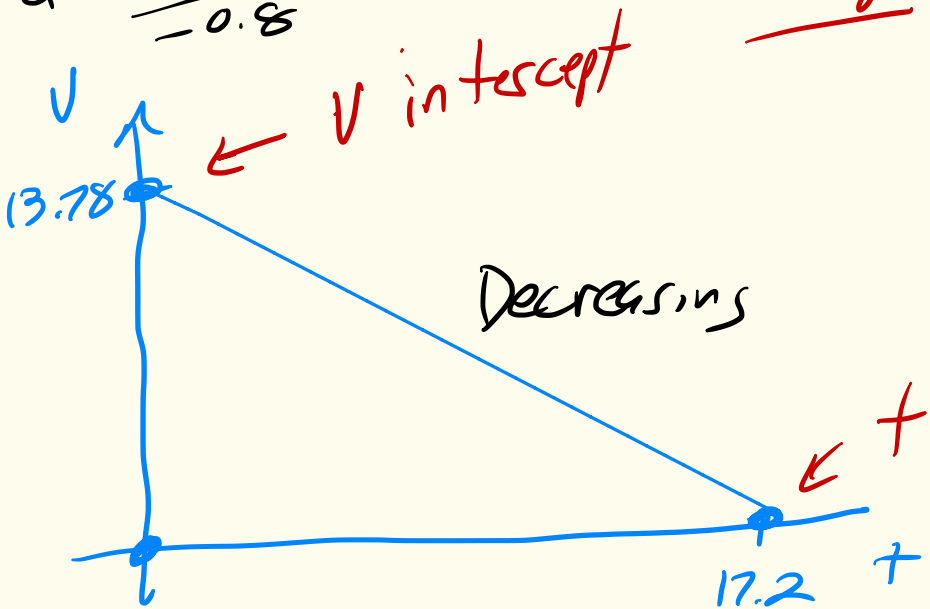
$13.78 - 0.8a = 0$

or $-0.8a = -13.78$

$a = \frac{-13.78}{-0.8} = 17.2$

Domain: $[0, 17.2]$

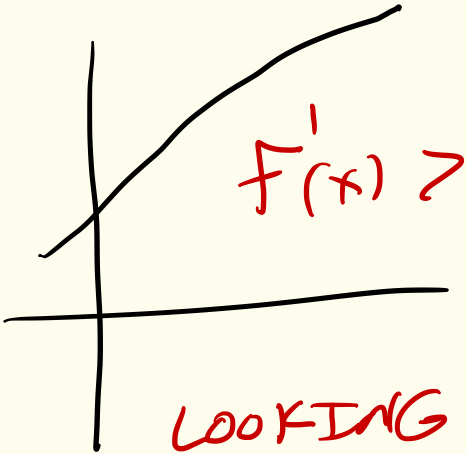
Range: $[0, 13.78]$



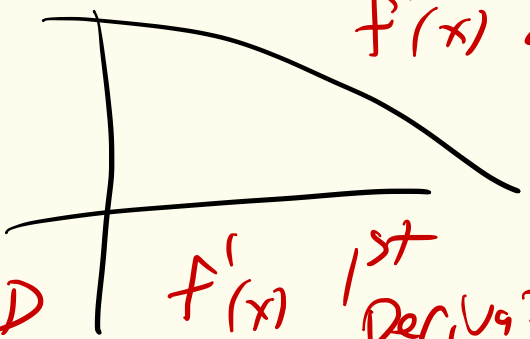
Increasing and Decreasing $y = f(x)$

Defn: $f(x)$ is INCREASING if the value of f increases as x increases.

Defn: $f(x)$ is DECREASING if the value of f decreases as x increases.



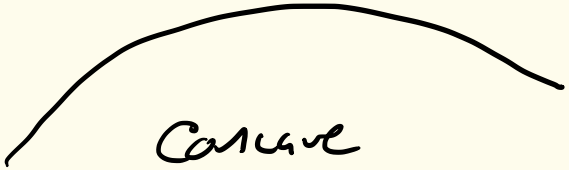
LOOKING AHEAD

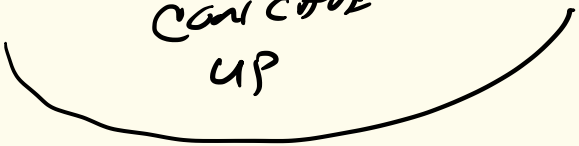


$f'(x)$ 1st Derivative

Concavity: Looking ahead

$f''(x) < 0$





$f''(x) > 0$

$f''(x)$ 2nd Derivative

Classical Physics: $F = ma$

a is 2nd derivative