HW 1   Due Jan 26 Tuesday (midnight)

Midterm 1   Feb. 9   Tuesday (Class Time)

Sample Test   Feb 9   midnight
   Problems   (upload to Moodle)

An person for now.
If things change, I will notify you.

Ch.1 Functions and rate of change

Def.   A function is a rule that takes certain
    numbers as input and assigns to each
    a definite output number.

Def. The set of input values is called the
        domain.

Def The set of output values is called the
        range.

<u>Remark</u>   Input is called independent variable

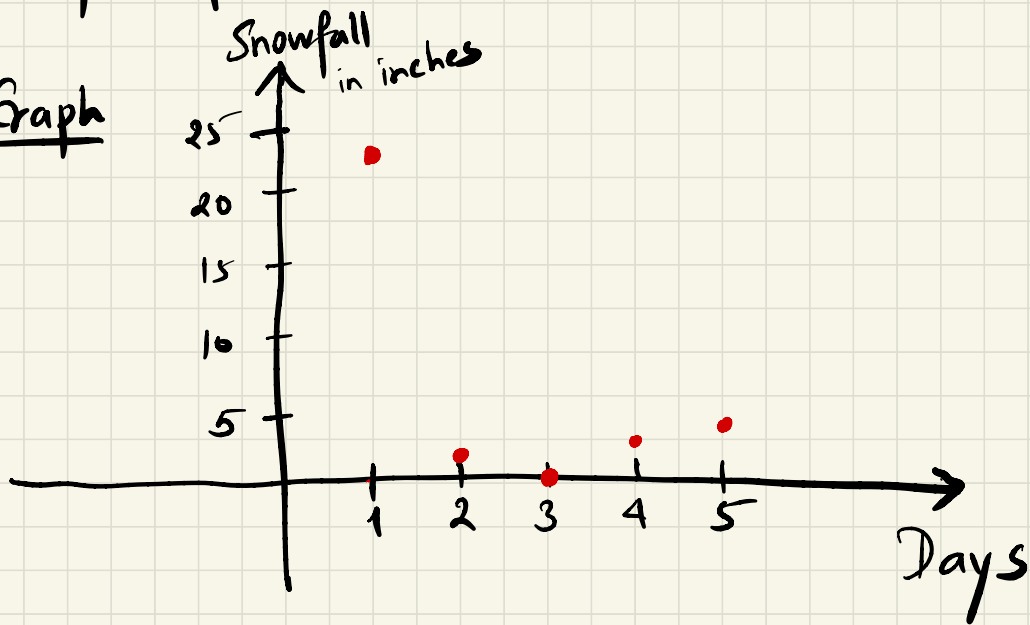   Output is called dependent variable

<u>Rule of Four</u>

Tables, Graphs, Formulas and Words

<u>Table</u>

Ex. Daily snowfall in inches for Boston

Days	1	2	3	4	5
Snowfall	22.1	0.2	0	0.7	1.3

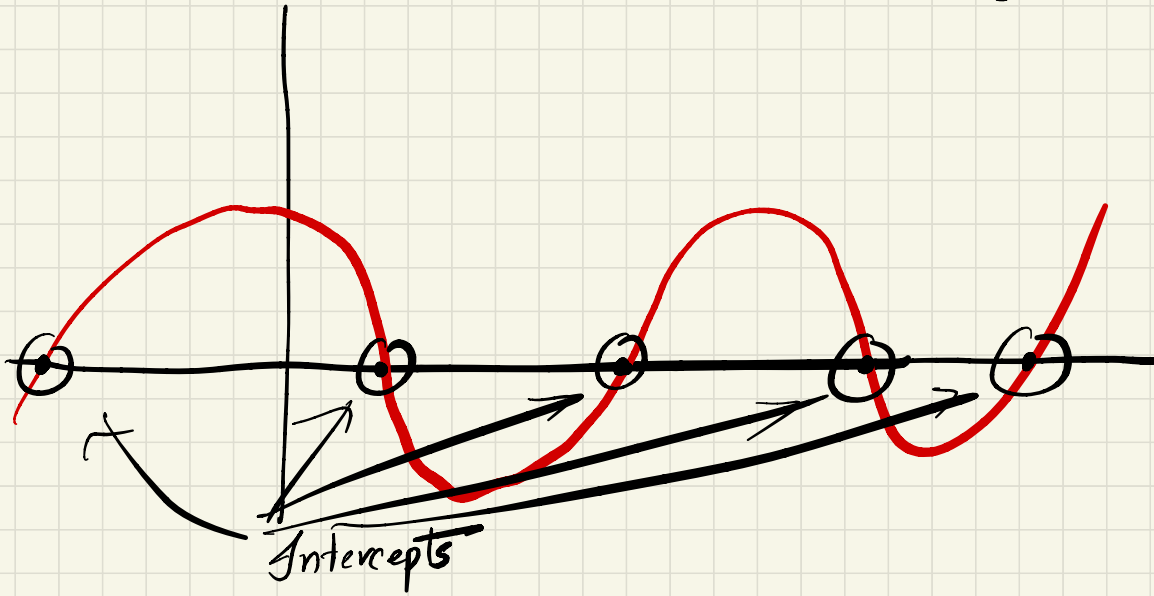<u>Graph</u>

Formula

Ex. $f(x) = x^2 + 4$

Words

Ex. Force is directly proportional to mass.

Notation

$$y = f(t)$$

expresses the fact that y is a function of t.
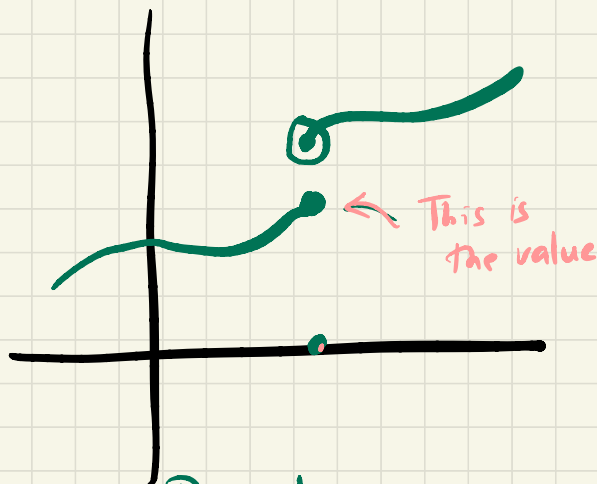
Def. An intercept of a function is the set of points where the output is zero. In other words, it is the horizontal intercepts of the graph.

Intercepts

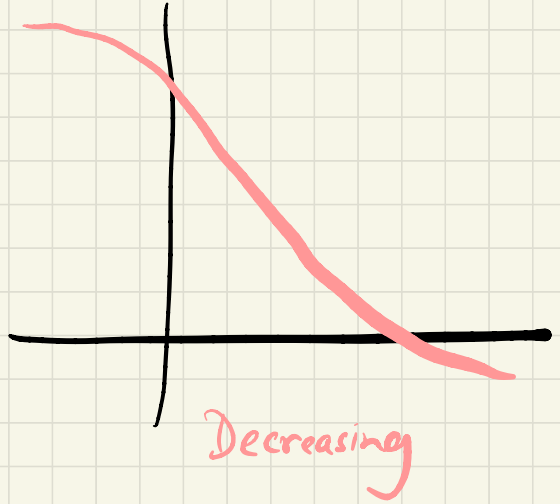**Def.** A function is <mark>continuous</mark> if you can draw it's graph without lifting your pen/pencil.

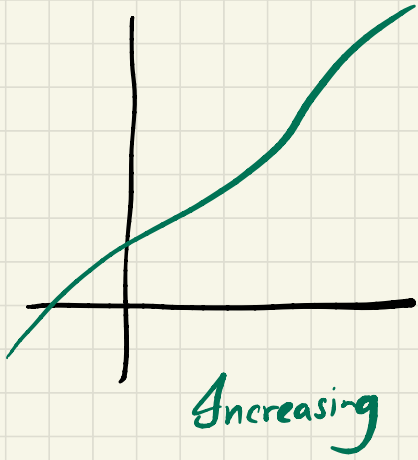Continuous function

← This is the value
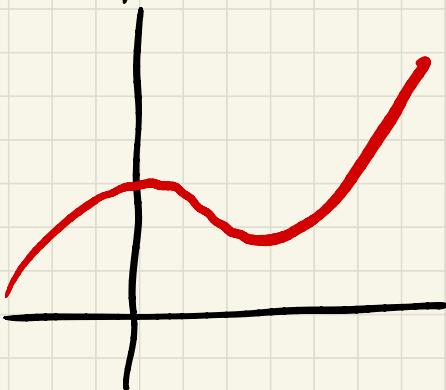
Discontinuous function

Def. A function f is ==increasing== if the values of $f(x)$ increases as x increases.

Def. A function f is ==decreasing== if the values of $f(x)$ decreases as x increases.

Increasing

Decreasing

Problem 1   The concentration of CO_2, $C = f(t)$
in the atmosphere,   in   parts per million (ppm)
is a function of years, t, since 2000.

a) Interpret $f(15) = 400$ in terms of CO_2.

Soln..   In 2015,   the concentration of CO_2
    was   400 ppm.

Problem 2. $y = f(x) = x^2 + 2$ X is in the
                                                    real line.

a) Find the value of y when x is zero.

Soln. $f(0) = 0^2 + 2 = \boxed{2}$

b) What values of x give y a value of 11?

Soln. $11 = x^2 + 2$

            $x^2 = 11 - 2$

            $x^2 = 9$

    Square roots on both sides

        $x = \pm\sqrt{9} = \boxed{\pm 3}$

c) Are there any values of x that give
   y a value of 1?
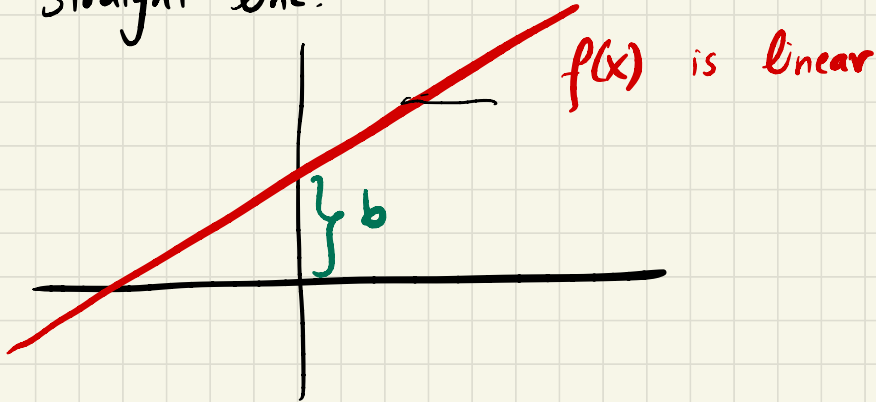
Soln.

$$1 = x^2 + 2$$
$$x^2 = 1 - 2$$
$$x^2 = -1$$

Since we are solving over real numbers, the
above equation does not have any solutions.

No

1.2 Linear Functions

Def.   A function is **linear** if its graph is a straight line.

$f(x)$ is linear

Formula:

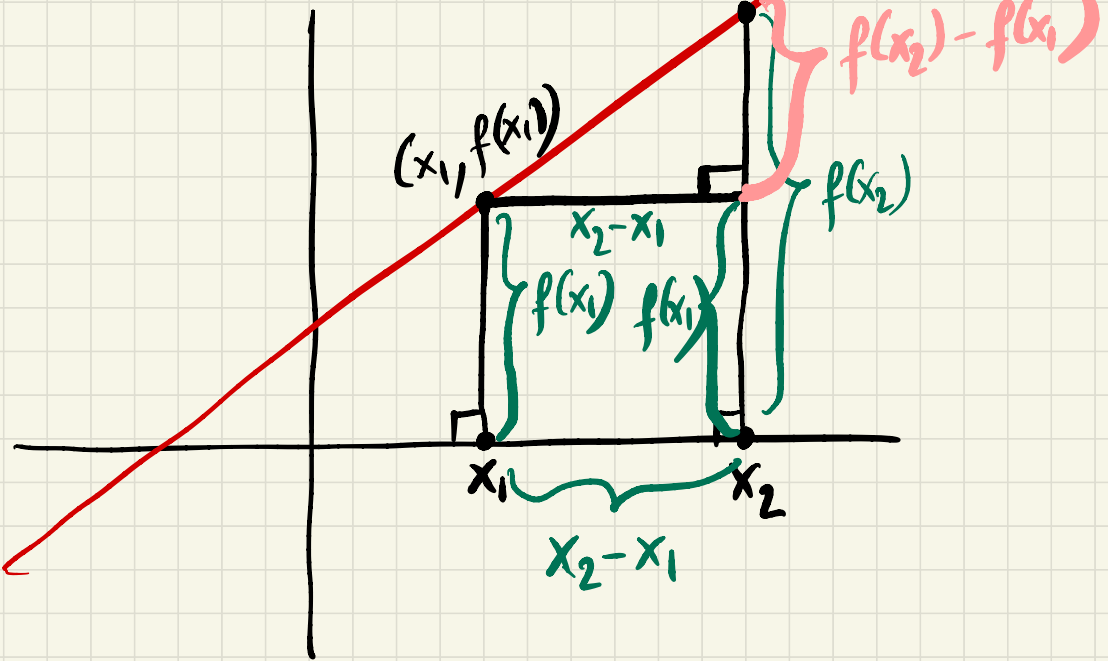$$f(x) = mx + b$$

Slope

y-intercept
vertical intercept

Slope

$$\text{Slope} = \frac{\text{Rise}}{\text{Run}}$$

$$= \frac{\Delta y}{\Delta x} \qquad \begin{array}{l}(\text{del } y) \\ (\text{del } x)\end{array}$$

$$= \frac{f(x_2) - f(x_1)}{x_2 - x_1}$$

$y = f(x)$

$(x_2, f(x_2))$

$f(x_2) - f(x_1)$

$f(x_2)$

$(x_1, f(x_1))$

$x_2 - x_1$

$f(x_1) \quad f(x_1)$

x_1

x_2

$x_2 - x_1$

<u>Recall</u>   Point slope form

$$m = \frac{y - y_0}{x - x_0}$$

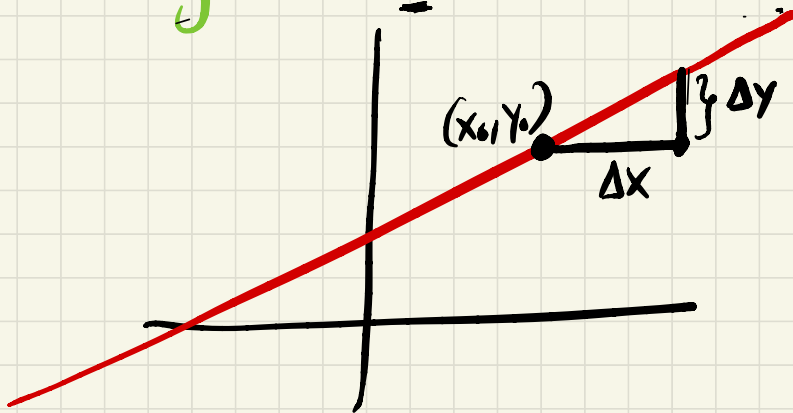$$\boxed{y - y_0 = m(x - x_0)}$$

Point slope
formula

where (x_0, y_0) is a point on the line.

2 choices for equation of line

1. $y = mx + b$ 2. $y - y_0 = m(x - x_0)$

Problem

Which of the following tables of values could represent a linear function?

a)

X	0	1	2	3
f(x)	25	30	35	40

Soln. Yes's linear because Slope $= \frac{\Delta y}{\Delta x}$ is constant.

b)

X	0	2	4	6
f(x)	10	16	26	40

Soln. Not a linear function. because slope is not constant.

c)

X	20	30	40	50
f(x)	2.4	2.2	2.0	1.8

Soln. Yes. It is linear because slope is constant.

ΔY

Δx

ΔY

Δx
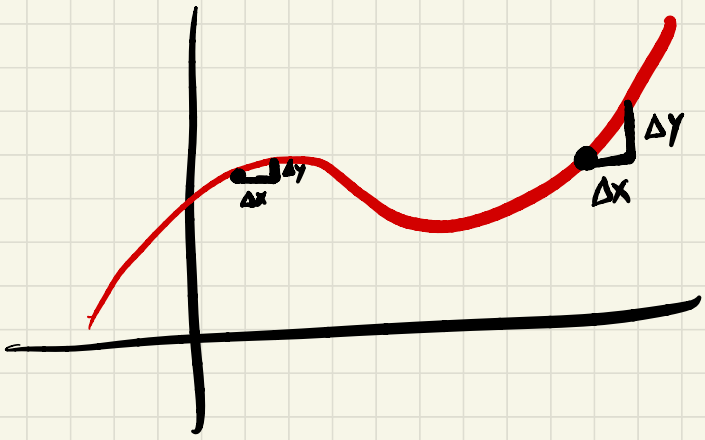
Problem

The data in the following table lies on a line. Find formulas for each of the following functions, and give units for the slope in each case.

p (dollars)	5	10	15	20
q (tons)	100	90	80	70

a) q as a function of P

b) p as a function of q

a) Soln. Use point slope form.

$(x_0, y_0) = (5, 100)$ [Not unique]

Slope $= m = \dfrac{\Delta y}{\Delta x} = \dfrac{-10}{5} = -2$

$y - 100 = -2(x - 5)$

$y = -2(x - 5) + 100$

$y = -2x + 10 + 100,$ $y = -2x + 110$

$$q = -2p + 110$$