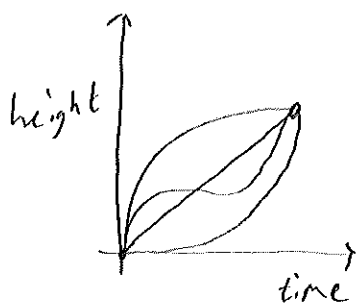


in 1.2 Average Rates of Change

1.2

Ex 1] (Motivation)

A plant grows 12 inches in 1 year. How many inches per month does it grow?

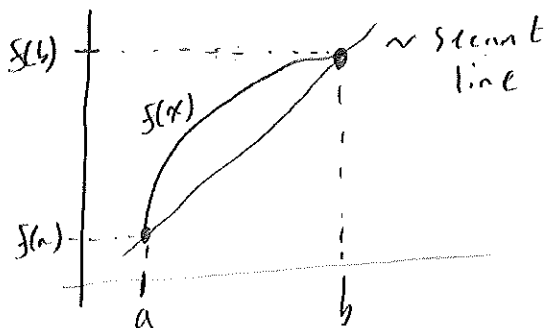


We don't know for sure, but on average, it grows 1 in/month.

Def] Given two points a and b on the graph of a function $f(x)$, the secant line is the line connecting a and b .

The average rate of change of $y = f(x)$ on $[a, b]$ is the slope of the secant line.

Ex]



average rate of change
= slope of secant line

$$= \frac{f(b) - f(a)}{b - a}$$

This is called a difference quotient.

(1)

Ex2) $f(x) = x^2$. Find the average rate of change on $[2, 4]$

1.2

$$\frac{f(b) - f(a)}{b - a} = \frac{f(4) - f(2)}{4 - 2} = \frac{4^2 - 2^2}{4 - 2} = \frac{16 - 4}{2} = 6$$

Ex3) A certain bacterial colony grows based the following model:

$$N(t) = 2 \times 1.3^t, \text{ where } \begin{array}{l} t = \text{time in hours} \\ N = \text{number of bacteria} \end{array}$$

a) Find the average rate of change from hour 3 to hour 5.

b) Interpret your answer.

Answer)

$$\begin{aligned} \text{a) Average rate of change} &= \frac{N(5) - N(3)}{5 - 3} \\ &= \frac{2 \times 1.3^5 - 2 \times 1.3^3}{2} \end{aligned}$$

$$= 1.3^5 - 1.3^3$$

$$= 1.5$$

b) Amount of bacteria grew at an average rate of 1.5 bacteria/hour over this 2 hour period.