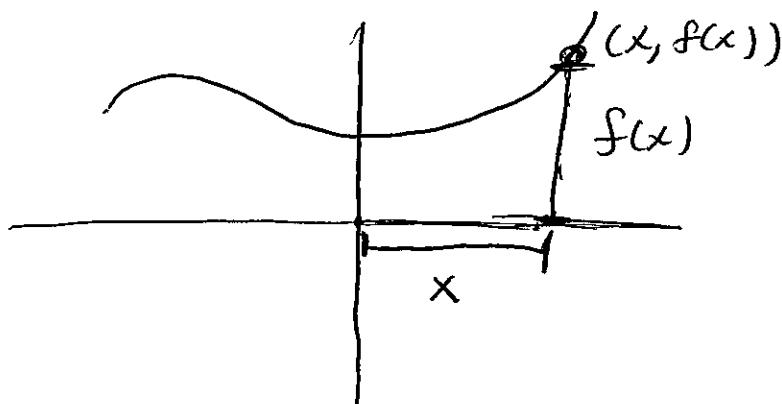
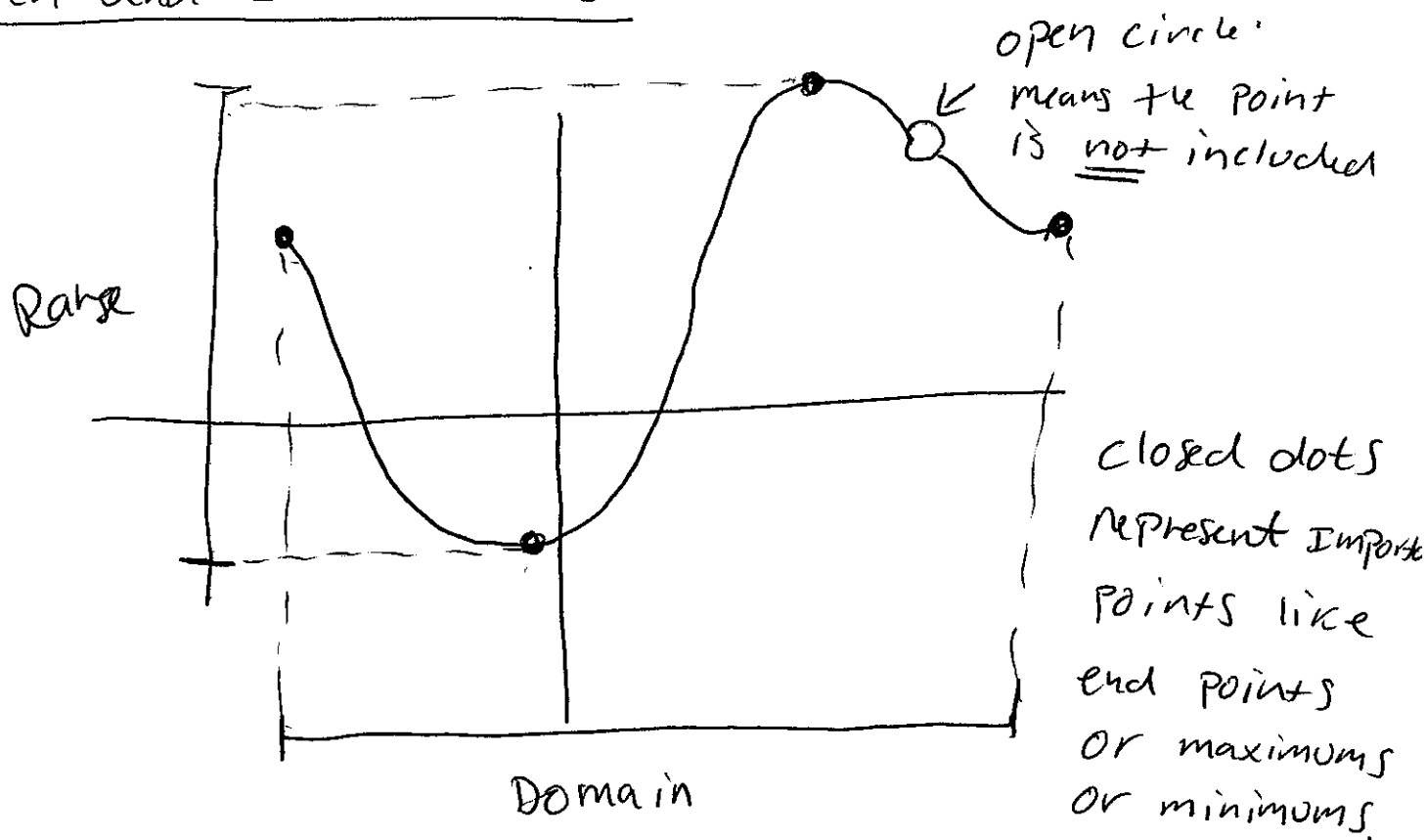


Analyzing Graphs of Functions,

The Graph of a function f is the collection of ordered pairs $(x, f(x))$ where x is the distance from $(0,0)$ along the x -axis and $f(x)$ the distance from $(0,0)$ along the y -axis



open and closed dots



Zeros of a function

(61)

Zeros of a function are the x -values where $f(x) = 0$ that is the x coordinate of the x intercept, we also call zeros roots

To find the zeros of a function set $f(x) = 0$ and solve for x ,

Ex

Find the zeros of

$$f(x) = x^2 - 6$$

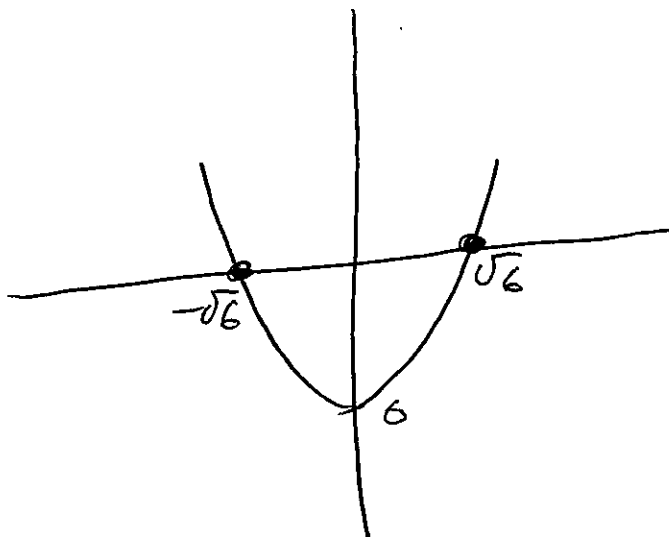
$$0 = x^2 - 6$$

$$+6 \quad +6$$

$$6 = x^2$$

$$\pm\sqrt{6} = x$$

$$\text{Zeros: } x = \sqrt{6} \quad x = -\sqrt{6}$$



EX

Find the zeros of

$$\sqrt{4-x^2} = f(x)$$

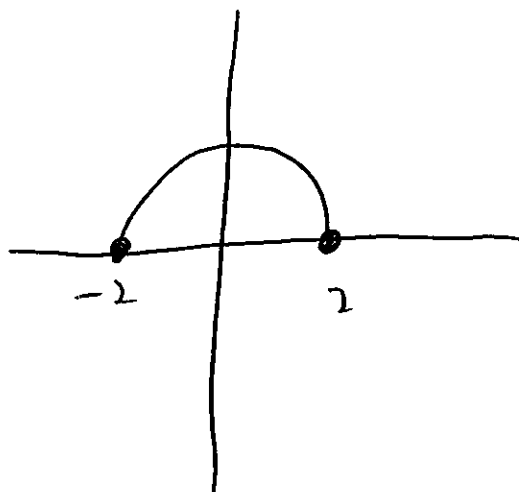
$$\sqrt{4-x^2} = 0$$

$$4 - x^2 = 0$$

$$4 = x^2$$

$$\pm 2 = x$$

$$\text{Zeros } x = 2 \\ x = -2$$



Increasing Decreasing and constant functions

A function is increasing on an interval when for every x_1, x_2 in the interval

$$\textcircled{f(x)} \quad x_1 < x_2 \Rightarrow f(x_1) < f(x_2)$$

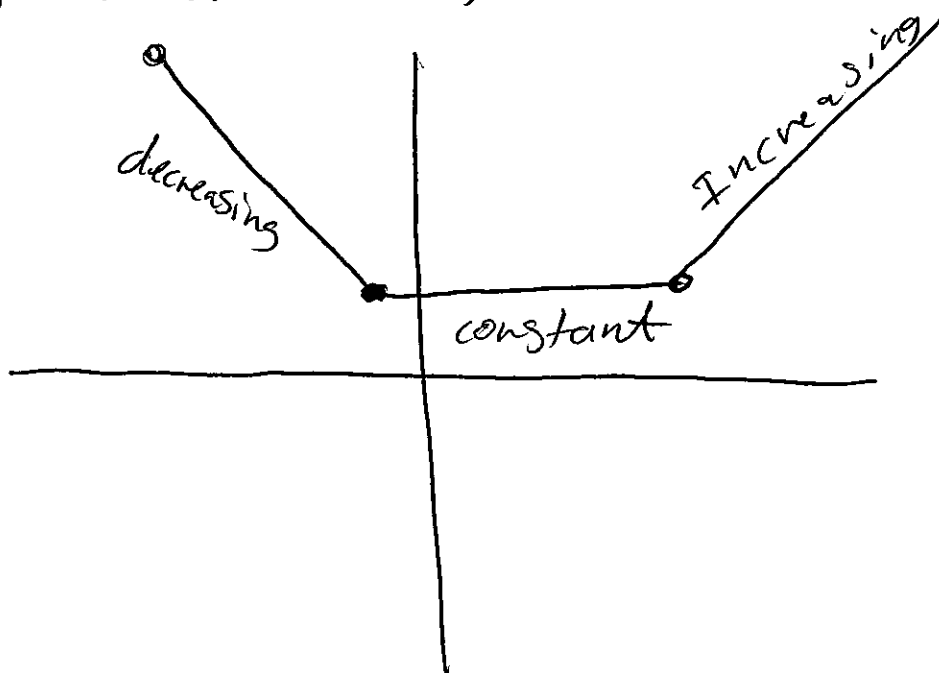
↑
Implies

A function f is decreasing on an interval when for every x_1, x_2 in the interval

$$x_1 < x_2 \Rightarrow f(x_1) > f(x_2)$$

A function f is constant on an interval when for every x_1, x_2 in the interval

$$\textcircled{f(x)} \quad f(x_1) = f(x_2)$$



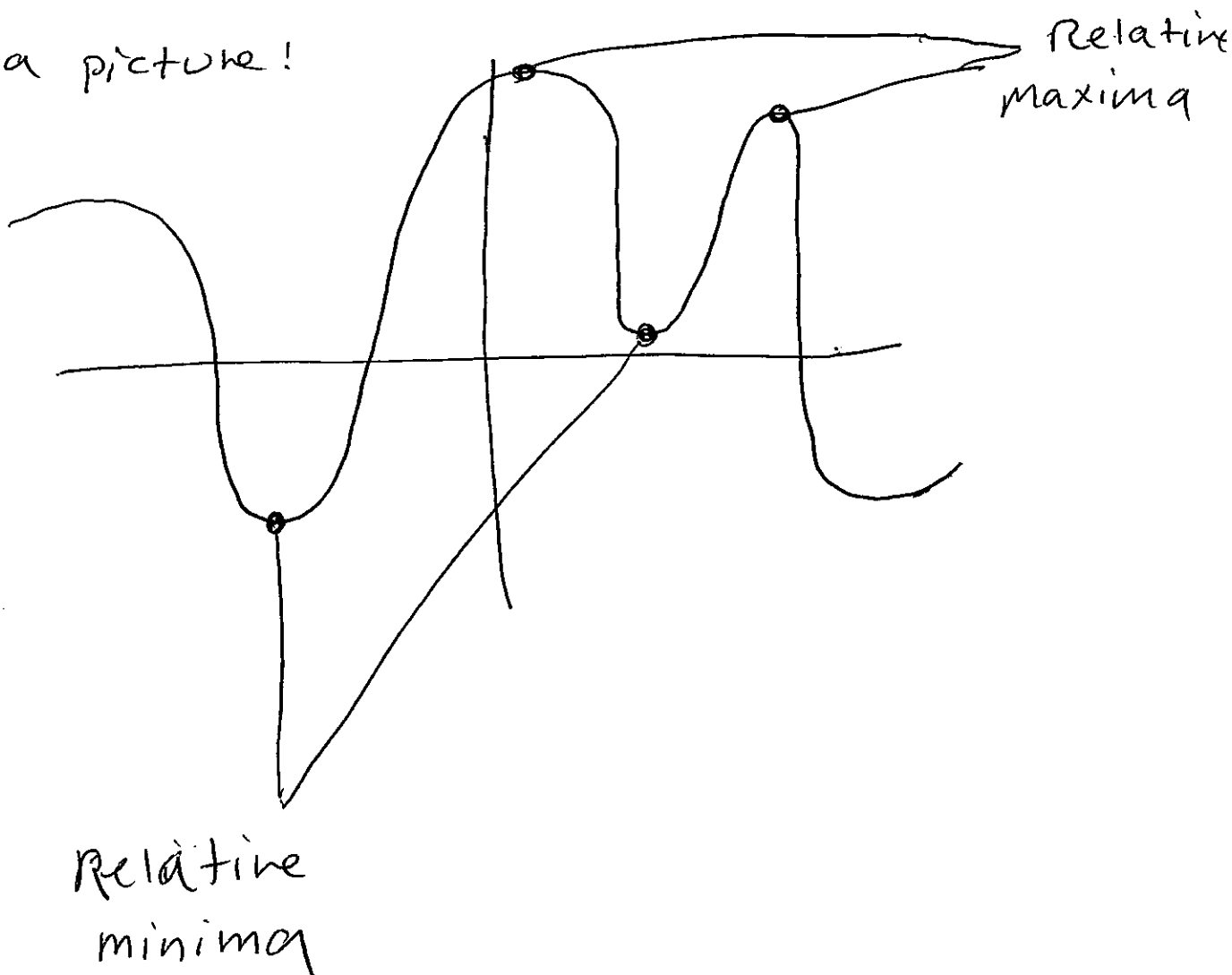
Relative maxima and minima

(63)

A function value $f(a)$ is called a relative maximum of f when there exists an interval containing a (x_1, x_2) such that $x_1 < x < x_2 \Rightarrow f(a) \geq f(x)$

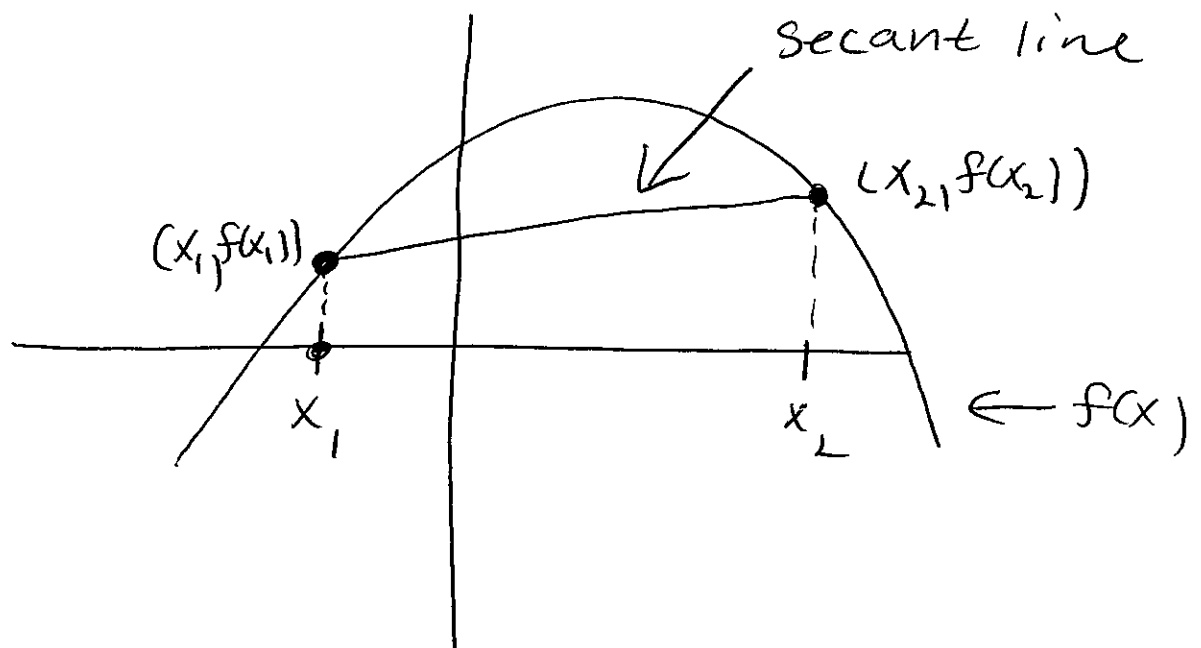
A function $f(a)$ is a relative minimum of f when there exists an interval containing a (x_1, x_2) such that $x_1 < x < x_2 \Rightarrow f(a) \leq f(x)$

In a picture!



Average rate of change

Recall that in Sec 1.3 we learned that the slope of a line is a rate of change. We can also say that the slope of a line connecting two points of a function is the average rate of change of that function between those two points.



The slope of the secant line is the average rate of change of $f(x)$ from x_1 to x_2 .

$m = \text{Avg rate of change}$

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

Even and odd functions

(65)

A function $y = f(x)$ is even when for each x in the domain of f $f(-x) = f(x)$

Ex

$f(x) = x^2$ replace x with $-x$

$$f(-x) = (-x)^2 = (-1)(x))^2 = (-1)^2 x^2 = x^2$$

$$\Rightarrow f(-x) = x^2 = f(x)$$

A function $y = f(x)$ is odd when for each x in the domain of f $f(-x) = -f(x)$

Ex

$f(x) = x^3$ replace x with $-x$

$$f(-x) = (-x)^3 = (-1)(x))^3 = (-1)^3 x^3 = -x^3$$

Note if $f(x) = x^3$ then $-f(x) = -x^3$

$$\text{Thus } f(-x) = -f(x)$$

Home work example Like #45 Hw #1

are the following functions even odd or neither

$$f(x) = x^4$$

$$g(x) = x^5$$

$$h(x) = x^4 + x^5$$

Soln

(66)

$f(x) = x^4$ replace x with $-x$

$$f(-x) = (-x)^4 = (-1)(x)^4 = (-1)^4 x^4 = x^4 = f(x)$$

$$\Rightarrow f(-x) = f(x) \text{ even}$$

$g(x) = x^5$ replace x with $-x$

$$g(-x) = (-x)^5 = (-1)(x)^5 = (-1)^5 x^5 = -x^5$$

$$-g(x) = -x^5 \Rightarrow g(x) = -g(x) \text{ odd}$$

$h(x) = x^4 + x^5$ replace x with $-x$

$$h(-x) = (-x)^4 + (-x)^5 = x^4 - x^5$$

$$h(-x) \neq h(x) \quad -h(x) = -x^4 - x^5 \neq h(x)$$

Neither.