Week 3 Wednesday

January 23, 2019 7:42 AM

Quiz Tues 3.3

Omit Section 3.3 # 69, 71, 73

3.3 Properties of Functions

- Symmetry
- Maximum/minimum points

Average rate of change

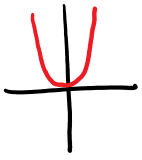
Symmetry

Even function: $f(-x) = f(x)$

Symmetric about y-axis

Ex: $f(x) = x^2$ is even

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



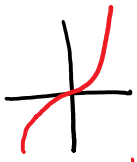
$y = x^2$ is even

Odd function: $f(-x) = -f(x)$

Symmetric about origin

Ex: $f(x) = x^3$ is odd

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



$y = x^3$ is odd

(Unchanged when we rotate by 180°)

Ex: Even, odd or neither?

Ex: Even, odd or neither? Check algebraically.

a) $f(x) = x^2 + 2x$

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

$= x^2 - 2x$

NEITHER

b) $f(x) = x^3 + 6x$

$f(-x) = (-x)^3 + 6(-x)$

$= -x^3 - 6x$

$= -(x^3 + 6x)$

$= -f(x)$ ODD

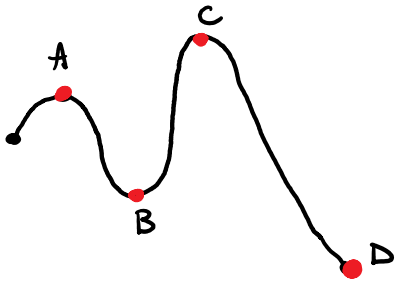
c) $f(x) = |x|$

$f(-x) = |-x|$

$= |x|$

$= f(x)$ EVEN

Maximum / Minimum Points



Local maximum point (hilltop) : A, C

Absolute maximum point (the highest) : C

Local minimum point (valley floor) : B

Absolute minimum point (the lowest) : D

Absolute minimum point (the lowest): D

Note: An endpoint can be an absolute max/min but not a local max/min.

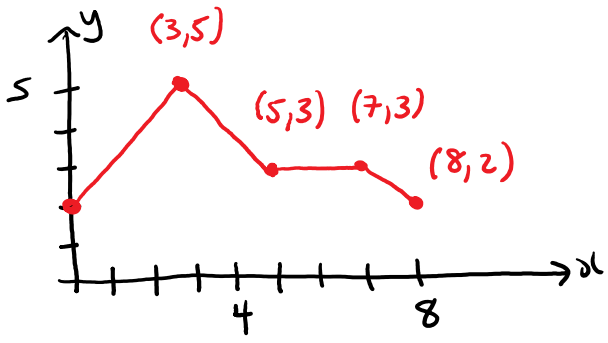
Terminology:

$x=2$, $y=3$

The function has an absolute (and local) minimum of 3 at $x=2$

y

Ex:



a) Absolute max?

Absolute max of 5 at $x=3$

b) Absolute min?

Absolute min of 2 at $x=0, 8$

c) Local max? (Hilltops)

Local max of 5 at $x=3$

d) Local min? (Valley floors)

None

e) Where is f increasing? (x-values)

from $x=0$ to $x=3$ ✓

$0 < x < 3$ ✓

as interval : $(0, 3)$ ✓

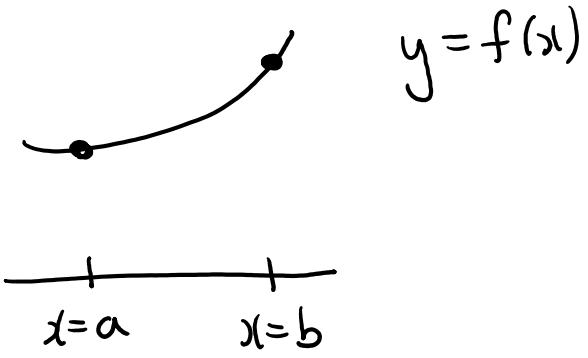
f) Where is f constant?

$5 < x < 7$

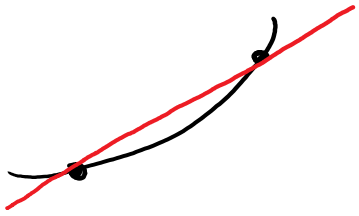
g) Where is f decreasing?

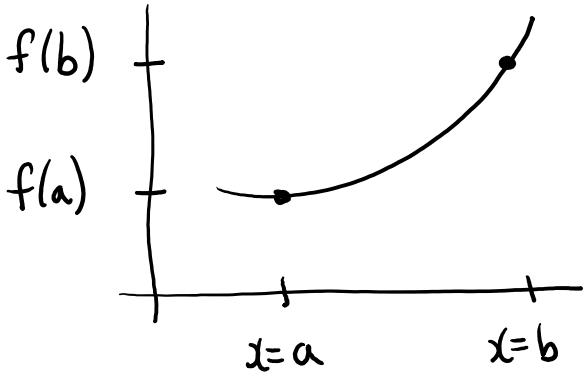
$3 < x < 5$ and $7 < x < 8$

Average Rate of Change



Definition: Average rate of change of f from $x=a$ to $x=b$ is the slope of the line:





Average rate of change $= \frac{\Delta y}{\Delta x} = \frac{f(b)-f(a)}{b-a}$