1/31/2011

Section 12

§2.2 Graphs of function

Pg 166 Basic Graphs

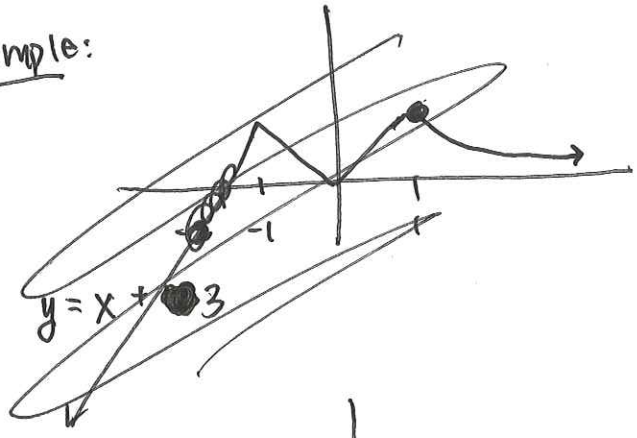
Def A graph of a function $y = f(x)$ is simply a graph consisting of points $(x, f(x))$

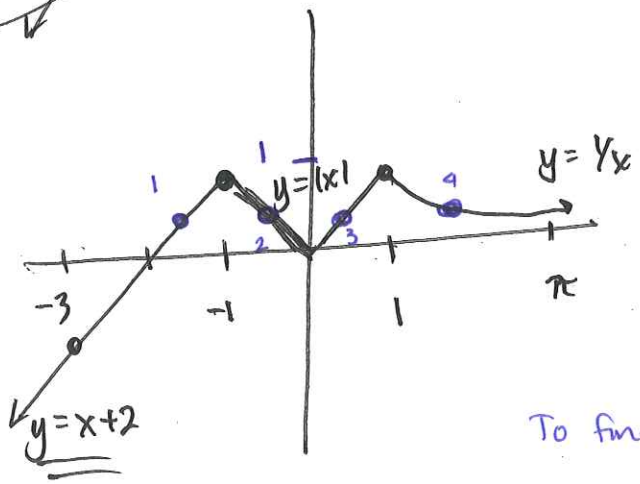
Domain: inputs (allowable)

Range: outputs (vertical values of points on a graph).

Piecewise defined functions:

Example:





$$f(x) = \begin{cases} x+2 & \text{if } x \le -1 \\ |x| & -1 < x < 1 \\ \frac{1}{x} & \text{if } x \ge 1 \end{cases}$$

Evaluate:

$f(-3) = -3 + 2 = -1$

$f(\pi) = \frac{1}{\pi}$

$f(?) = \frac{1}{2}$

To find 1: $\frac{1}{2} = x + 2$

$-\frac{3}{2} = x$

To find 2, 3: $\frac{1}{2} = |x|$

$\pm\frac{1}{2} = x$

To find 4: $\frac{1}{x} = \frac{1}{2} \Rightarrow x = 2$

Intuitively, a piecewise defined function is simply a function whose formula depends on the input.

Example 1: ⓐ Evaluate $f(-1), f(2), f(0), f(4)$

ⓑ Sketch a graph.

given $f(t) = \begin{cases} 1/x & \text{if } x \le -1 \\ x^2 & \text{if } -1 < x \le 2 \\ 3 & \text{if } x > 2 \end{cases}$

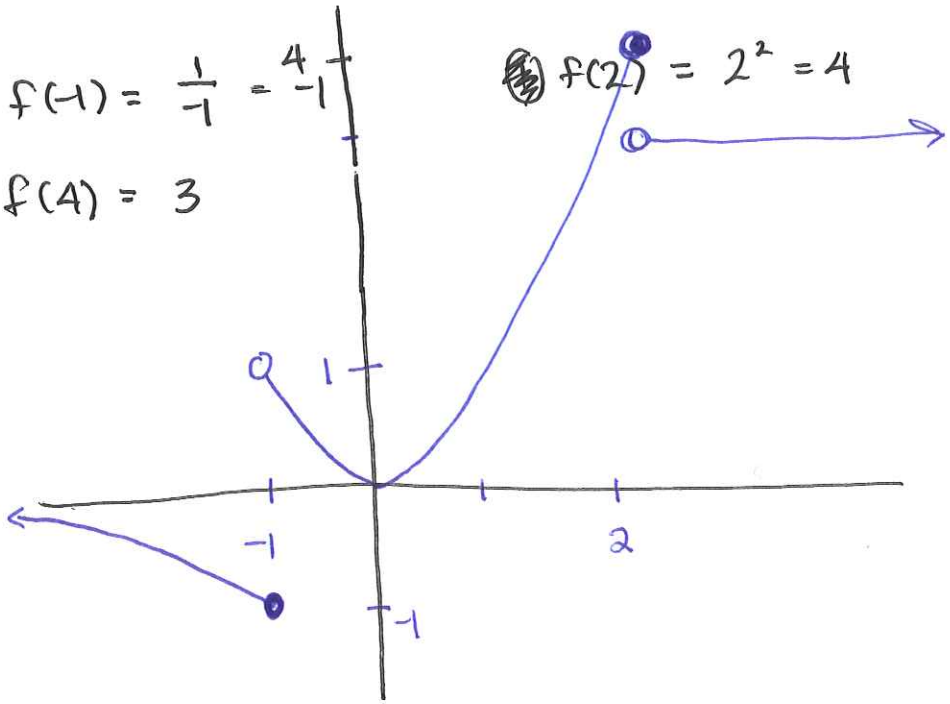
ⓐ $f(-1) = \frac{1}{-1} = \frac{4}{-1}$

ⓑ $f(2) = 2^2 = 4$

ⓒ $f(0) = 0^2 = 0$

$f(4) = 3$

ⓑ



Not in the book. (except for increasing, decreasing)

§2.3

Concept: (inputs)

1.) Interval of positive / negative (y values)

Basic Idea:

positive: Graph sitting above x-axis

negative: below x-axis

} position.

Formal defⁿ: (neg)

$f(x)$ is positive on interval of input values (a, b) if all y-values are positive. (neg)

inputs

2.) Intervals of increasing/decreasing (y-values)

increasing: y values rising / uphill
decreasing: y values falling / downhill
} direction

read the book.

tricky

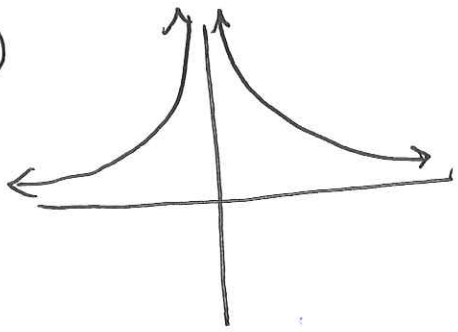
Can mostly be approximated in precalc.

3.) Intervals of concave up/concave down.

concave up: bends upwards
concave down: bends downwards
} how is it curved?

Example 2: Determine the intervals of (a) positive (b) increasing (b) concave down

(i)



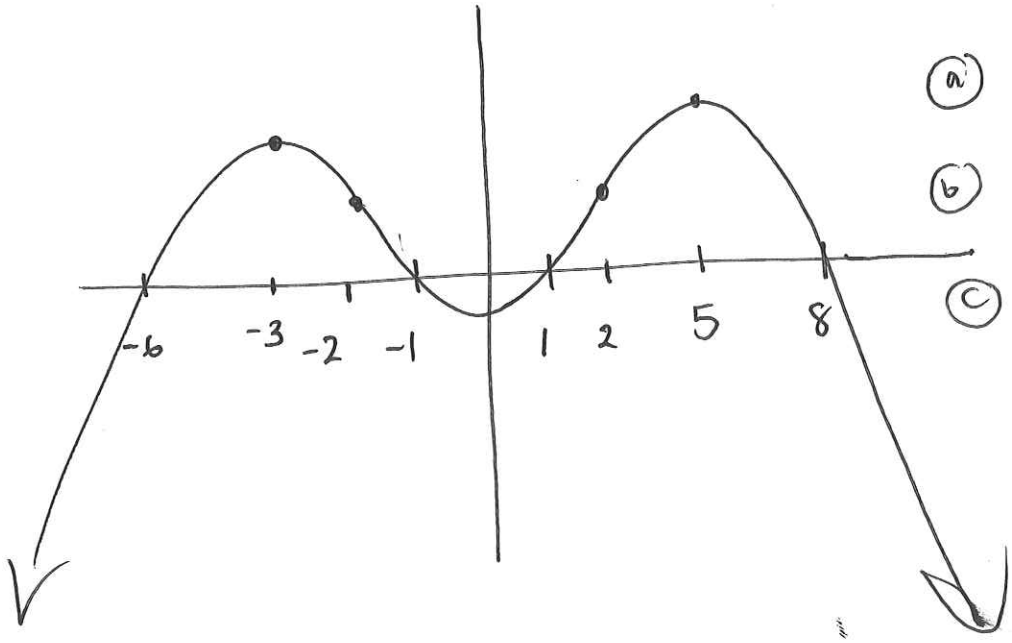
(a) $(-\infty, 0) \cup (0, \infty)$

$-\infty < x < 0$ or $0 < x < \infty$

(b) ~~$(0, \infty)$~~ $(-\infty, 0)$

(c) none

(ii)



(a) $(-6, -1) \cup (1, 8)$

(b) $(-\infty, -3) \cup (0, 5)$

(c) $(-\infty, -2) \cup (2, \infty)$

Avg Rate of Change:

looks like a slope!

$$\frac{\Delta \text{output}}{\Delta \text{input}}$$

The average rate of change of $f(x)$ over $[a, b]$ is

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

"difference quotient"

Graphically: