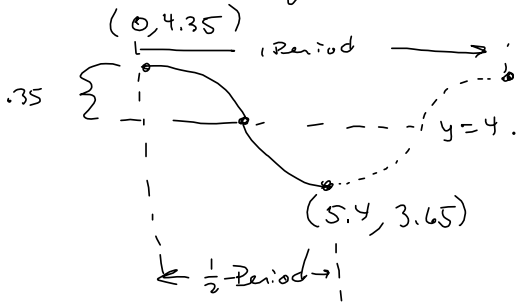
§1.3 #26

Max 4.35

MIDLINE 4

Time between high & low was 5.4 days



$a\cos(b(x-c))+d$

$.35\cos($

$\cos(bx-bc)$

Period = $5.4 \cdot 2 = 10.8$

Want

$bx = 2\pi$ when $x = 10.8$

$10.8\,b = 2\pi$

$b = \frac{2\pi}{10.8} = \frac{\pi}{5.4}$

So $.35\cos\left(\frac{\pi}{5.4}(x-c)\right)+d$

$y = 4$ = midline

$.35\cos\left(\frac{\pi}{5.4}(x-c)\right)+4$

& we can start anywhere (so $x=0$ is best).

$.35\cos\left(\frac{\pi}{5.4}x\right)+4$

$.35\cos\left(\frac{\pi}{5.4}(x-ANY)\right)+4$, since starting point isn't specified.

Days of sunlight

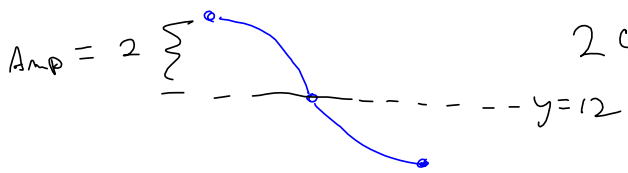
Equinox : 12 hrs March 21st, Sept. 21st

Solstices : June 21st , Dec 21st

J F M A M J Let t = day of year

31+28+31+30+31+21 = 172 START (Jan 1st : t = 1)

(June 21st, 14 hrs) High Point



$2\cos\left(\frac{2\pi}{365}(x-172)\right)+12$

Continuity $\longleftrightarrow$ Mostly about Domain

Most of the functions we can write are continuous everywhere on their domains, and so it all goes back to domain:

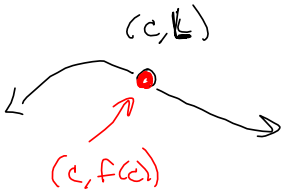
$\frac{\text{anything}}{0}$, $\sqrt{\text{negative}}$

$\frac{\text{Numerator}}{\text{Denominator}}$ Need Denominator $\neq 0$

$\sqrt[2n]{\text{Radicand}}$ Need Radicand ≥ 0

$f(x)$ is continuous at $x=c$ means

$\lim_{x \to c} f(x) = f(c)$



Skip back to Domain

from 1.3

$f(x) = \sqrt{3-x}$, $g(x) = \sqrt{x^2-1}$

$f \pm g = \sqrt{3-x} \pm \sqrt{x^2-1}$

$fg = \sqrt{3-x}\sqrt{x^2-1}$

} D: Need $3-x \geq 0$ and $x^2-1 \geq 0$

$3-x \geq 0$

$3 \geq x$

$x \leq 3$

number-line graph 3

$= \mathcal{D}(f) = (-\infty, 3]$

$x^2 - 1 \geq 0$

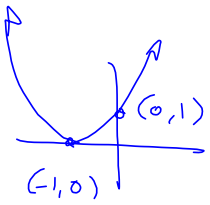
$(x-1)(x+1) \geq 0$

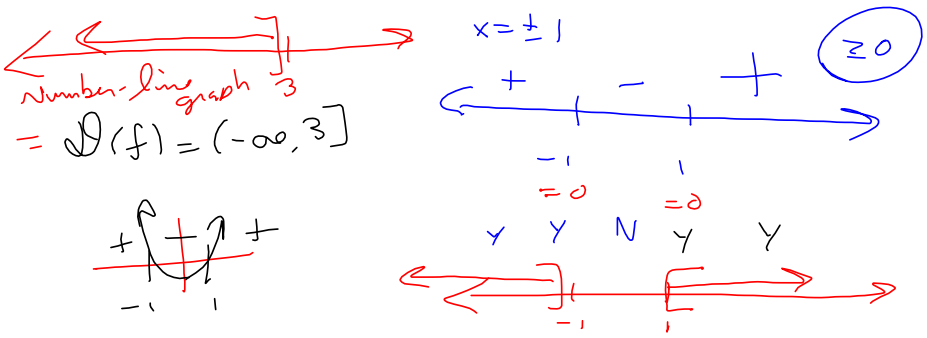
"critical" vals:

$x = \pm 1$

$x^2 = 1$

$x = \pm\sqrt{1} = \pm 1$





$\mathcal{D}(g) = (-\infty, -1] \cup [1, \infty)$

OR

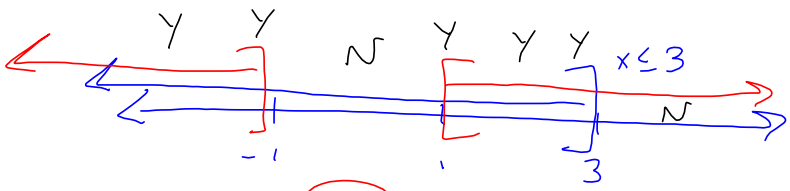
conjunction

The overlap

$\mathcal{D}(f+g) = \mathcal{D}(f-g)$

$= \mathcal{D}(fg) = \mathcal{D}(f) \cap \mathcal{D}(g) = \{x \mid x \in \mathcal{D}(f) \text{ AND } x \in \mathcal{D}(g)\}$

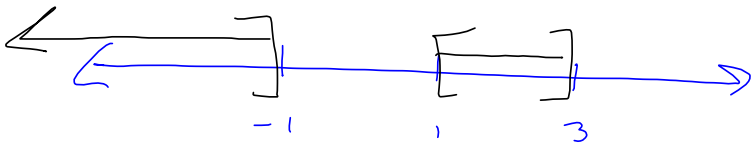
Gotta keep 'em both happy



AND

$x \leq -1$ OR $x \geq 1$

OR is disjunction



is the intersection

$\mathcal{D}(f) \cap \mathcal{D}(g)$

$= (-\infty, -1] \cup [1, 3]$

Last wrinkle

$\mathcal{D}\left(\frac{f}{g}\right)$ = same as $\mathcal{D}$ of the others, except throw out $x \ni g(x) = 0$

$\mathcal{D}\left(\frac{f}{g}\right) = \mathcal{D}(f+g) \setminus \{x \mid g(x) = 0\}$

Find where $g(x) = 0$ & throw 'em out.

$\sqrt{x^2 - 1} = 0$

$x^2 - 1 = 0$

$x = \pm 1$

Symbolically

$\left((-\infty, -1] \cup [1, 3]\right) \setminus \{\pm 1\}$

$= (-1, -1) \cup (1, 3]$ ← ∞ is my solns?

$(-\infty, -1) \cup (1, \infty)$