Development of KeTLTS(LMS) Using Only One Line of Text

Setsuo Takato

Shibaura Institute of Technology

KeTCindy Center

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Self Introduction

- I am Setsuo Takato from Japan.
- I have been developing KeT series.

with collaborators.

Go to ChatGPT(recent version)

and ask her/him 'What is ketcindy?'

ChatGPT's Answer

Ketcindy is an extension of the dynamic geometry software Cinderella, used primarily for creating high-quality mathematical graphics. It allows users to generate illustrations for teaching, research, or publishing, especially in fields like geometry, calculus, and algebra. Ketcindy is particularly valued for its ability to produce precise, customizable, and publication-ready vector graphics that integrate seamlessly with LaTeX.

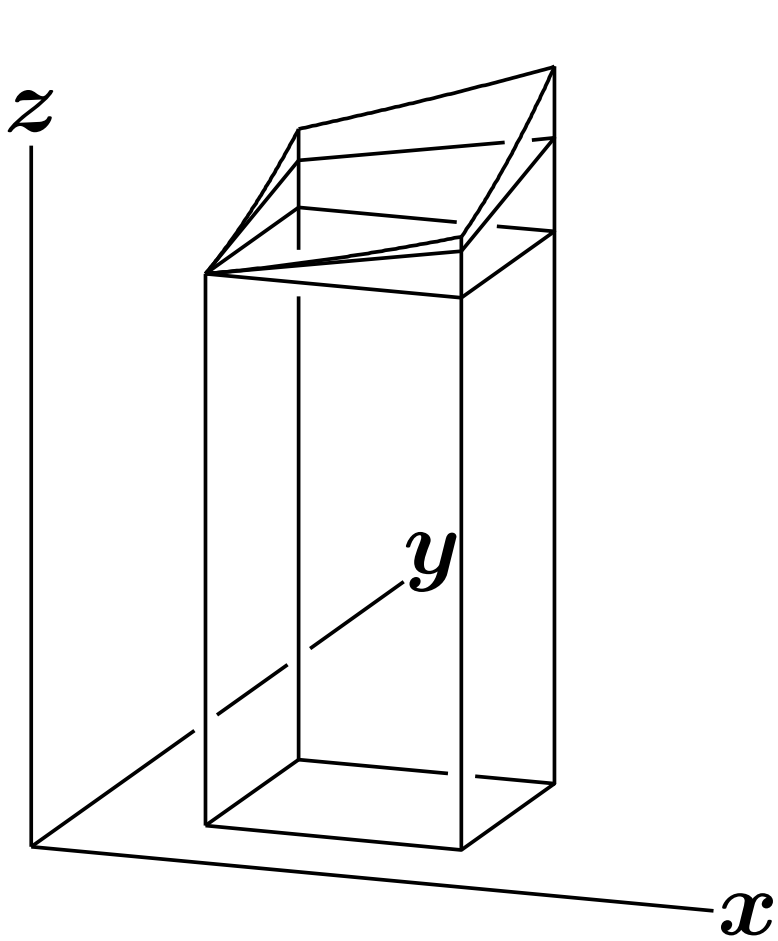
History (1) KETpic

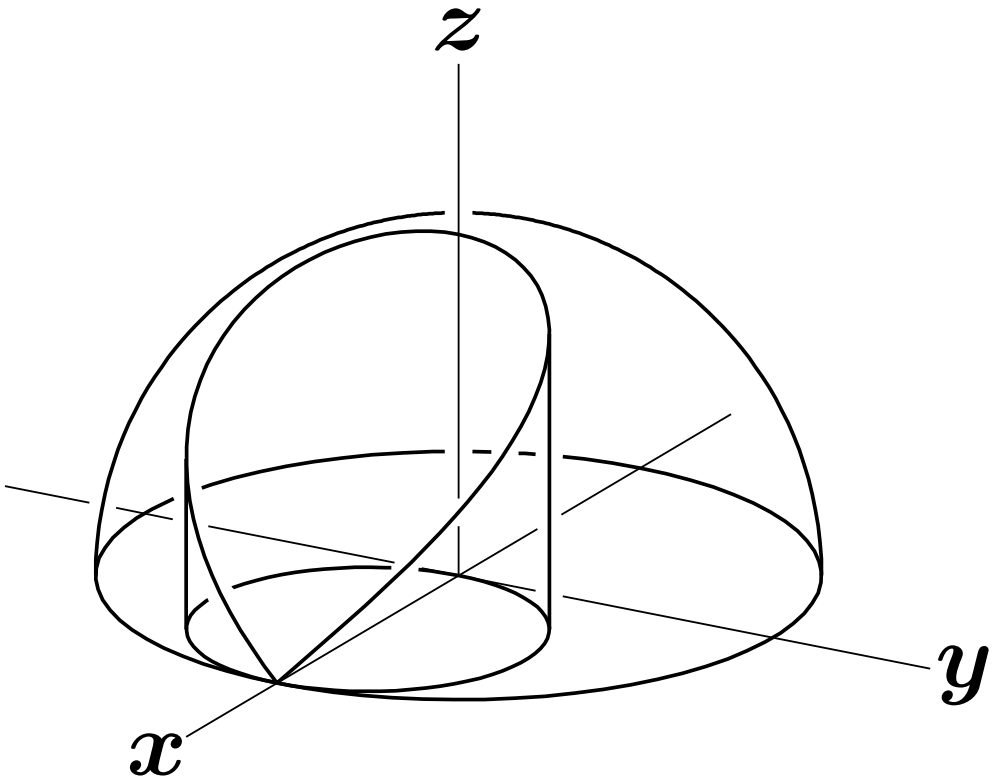
2006 We released the first version of KETpic.

- It uses mathematical softwares such as Maple, Mathematica, Scilab and R to create figures for TEX.
- We named it as an abbreviation of

  'Kisarazu Educational Tpic'.

Sample





History (2) KETCindy

2015 We released the first version of KETCindy.

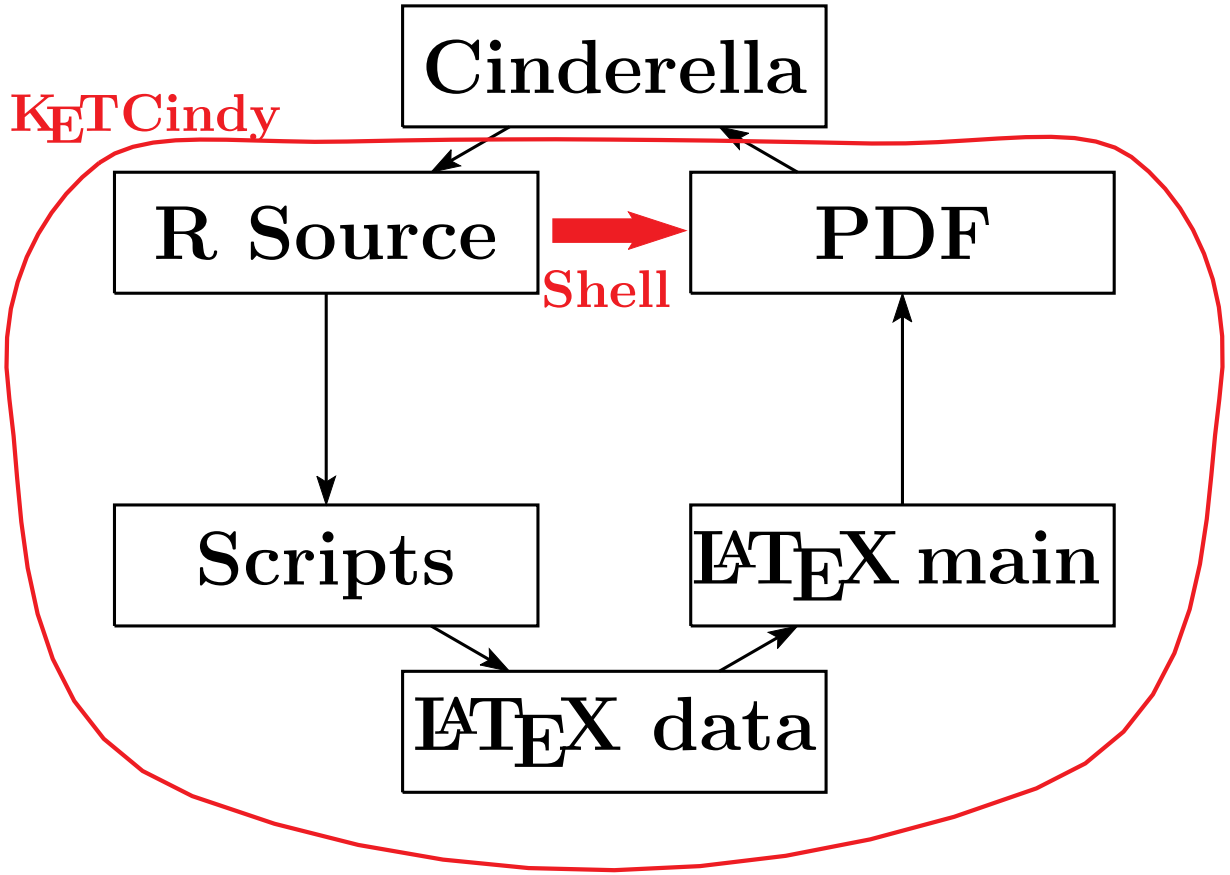
- It generates TEX figure files from Cinderella, Dynamic Geometry System developed by Gebart and Kortenkamp.
- We have to change the meaning of KeT, so Kisarazu Educational Tpic

  $\Longrightarrow$

  Kisarazu Educational Takato

  and his fun friends.

Flow of KeTCindy



Features of KETCindy

- You can make figures interactively.

  Geometric elements can be used in it.
- It supports batch(shell) processing of Java.
- It can also call Maxima and gcc and use the data.
- It also supports pict2e and TikZ as graphical data in TEX.

KETCindy Demo

How to Install KeTCindy

- Suppose you have installed TeX system.

(1) Search 'ketcindy home'. Select English.

(2) Go to Cinderellav3.0b and install it.

(3) Go to KeTCindy. Unzip ketcindy.zip.

(4) Launch 'ketcindysettings.cdy' in 'doc'.

(5) Click buttons 'Mkinit' and 'Update'.

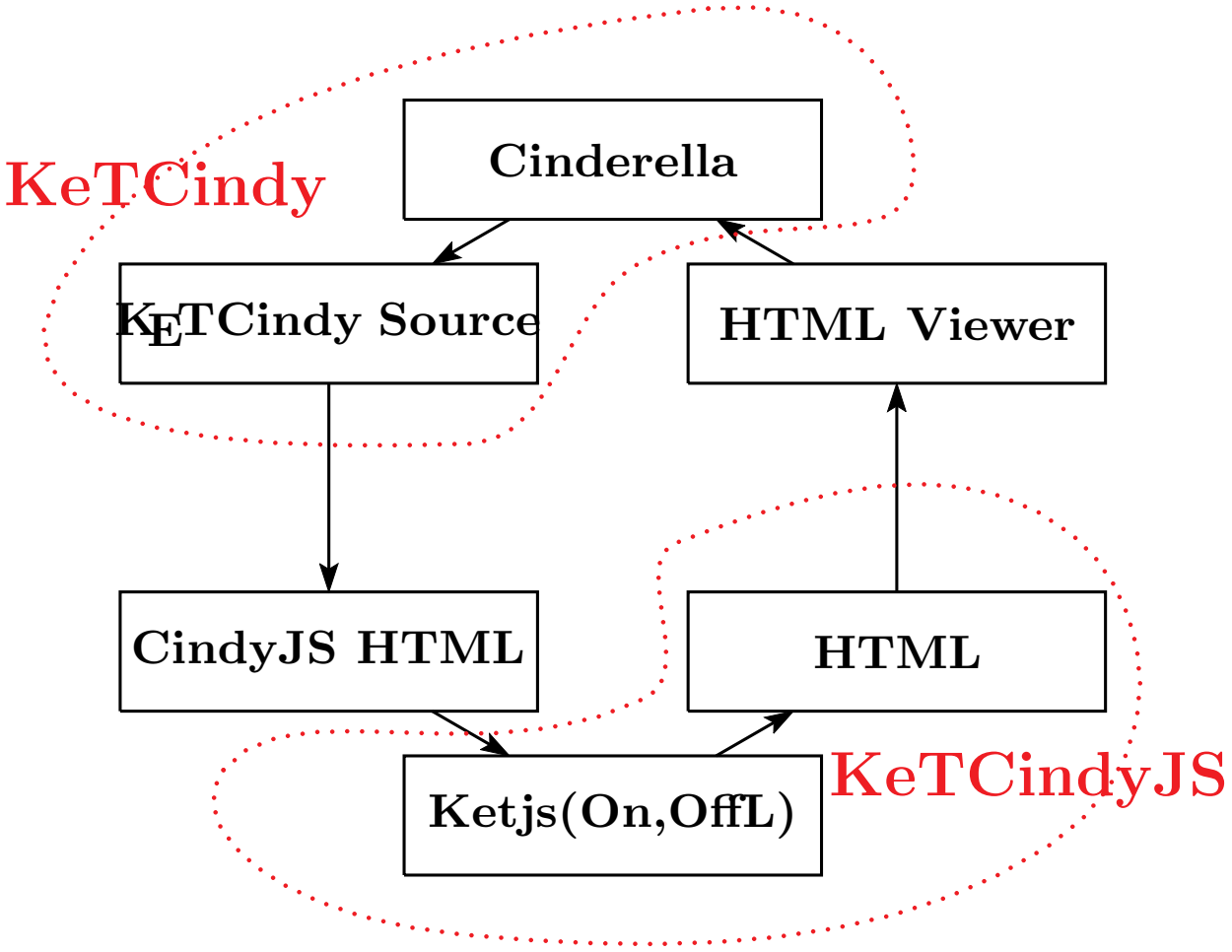
Execute 'Update' as an administrator.

History (3) KETCindyJS

2016 CindyJS group released CindyJS.

- It creates web contents(HTMLs) almost compatible with Cinderella.
- We have developed KETCindyJS.

Flow of KETCindyJS



How to Use KETCindyJS

- You only need KETCindy, no TEX.

(1) Use a file in the 'sample' or 'template'.

(2) Make figures in the Cinderella screen.

(3) Click 'Export as an HTML' in the menu.

(4) Click 'KetjsoffL' to make HTML without network.

  * It creates folder 'ketcindyjs' if not exists.
  * The folder includes libraries of CindyJS and KaTeX.

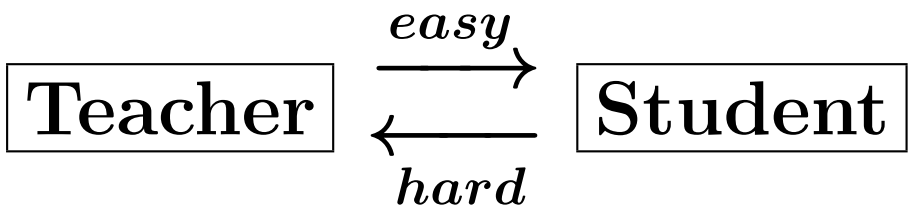
KETCindyJS Demo

History (4) KeTLMS(LTS)

KeTCindy Learning data Transfer System

2020 Covid-19 changed classes drastically.

- Online classes became mainstream in many schools.
- Mathematics classes were no exception.
- Teachers faced the big issue of how to exchange mathematical formulas.



- We decided to develop KeTLMS(LTS).

KeTLMS(LTS)

Developing KeTMath

- This system uses only one line text.
  - * It is lightweight and easy to process.
- The followings are required
  - (1) Conversion Rules (KeTMath Rules)
  - (2) Function to convert a text to TEX format
  - * CindyJS implements KaTeX (v0.8).
    - It displays expressions as 2D in HTML.

KeTMath

- KeTMath Rules

  Here are some typical examples.

  fr(a,b) $\Longrightarrow \frac{a}{b}$

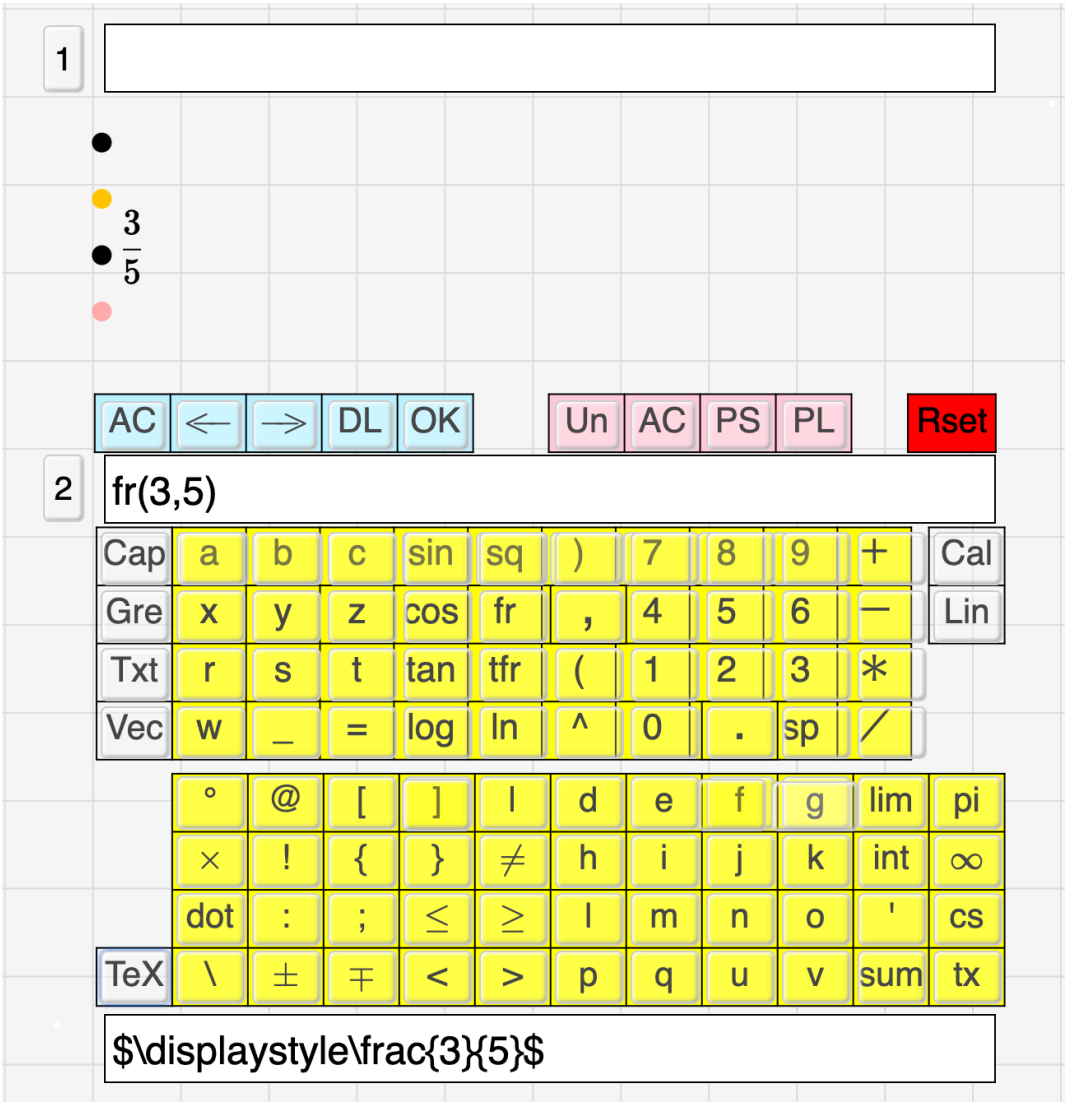
  sq(n,a) $\Longrightarrow \sqrt[n]{a}$

  diff(y,x) $\Longrightarrow \frac{dy}{dx}$

- Conversion Functions

  Totexform,Tocindyform,Tomaxform

Screen of ketmath.html



(1) Initial Screen

(2) Click 'fr'

(3) Input '3'

(4) Click '→'

(5) Input '5'

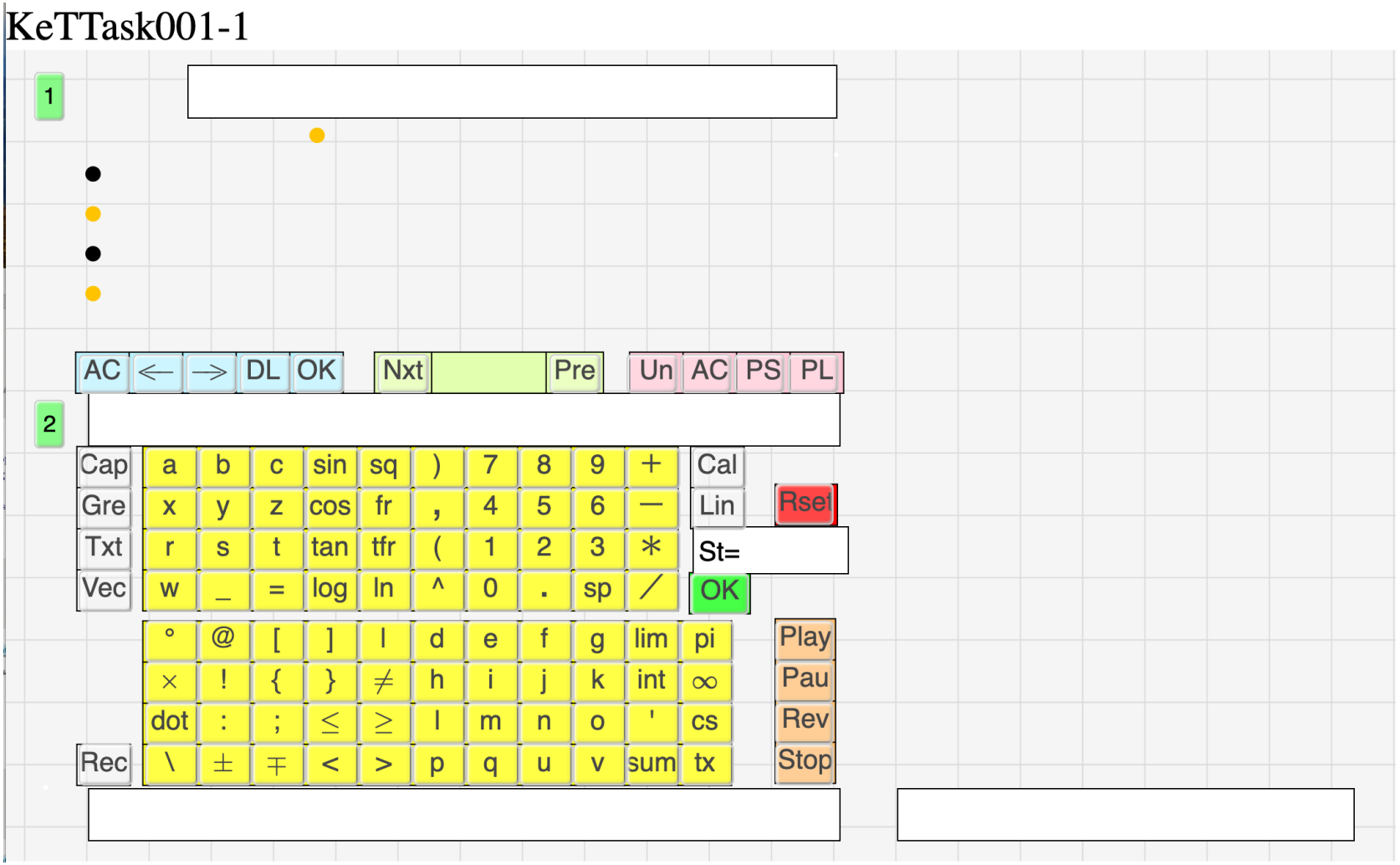
(6) Click OK

(7) Click 'TeX'

Development of KeTLMS(LTS)

- 'kettask(+ID).html' is created by adding question data to the template file.
- It exchanges questions and answers written in KeTMath rules.
- 'toolketmath.cdy' creates the html file.

Initial screen of kettask



How to create kettask.html

(1) Goto 'ketcindy home'.

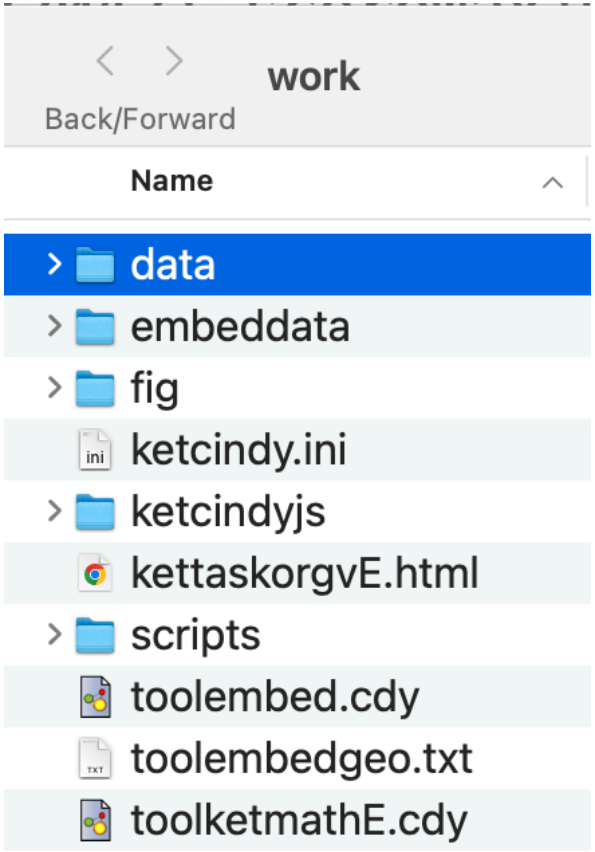
https://s-takato.github.io/ketcindyorg/indexe.html

(2) Install Cinderella.

(3) Download KeTLMS.

I use the bare minimum of files in 'work'.

(4) I will explain the rest by actually running it.



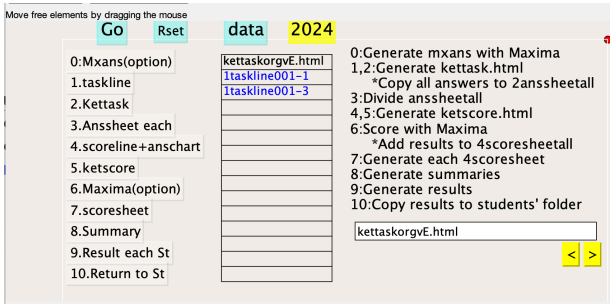
How to create questions

- Go to ‘work/data’
- Open ’student2024.txt’ and register students.
- Open ’question(001-1).txt’ and write questions.

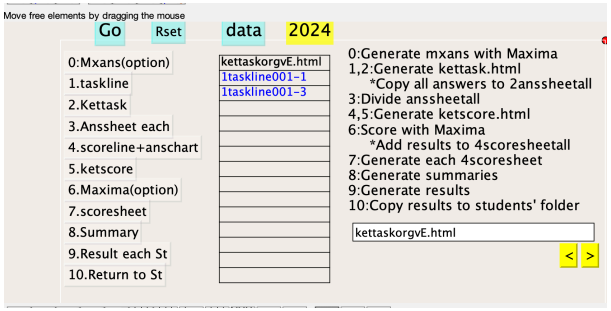
```
Q
Differentiate
[1] y=sin(2x)
[2] y=e^(2x)
Sheet
[1]y'= ::5
[2]y'= ::5
Ans
[1]y'=2cos(2x)
[2]y'=2e^(2x)
```

How to create kettask(xxx).html

- Launch ‘toolketmathE.cdy’
- Click and ‘1.taskline’ and ’Go’

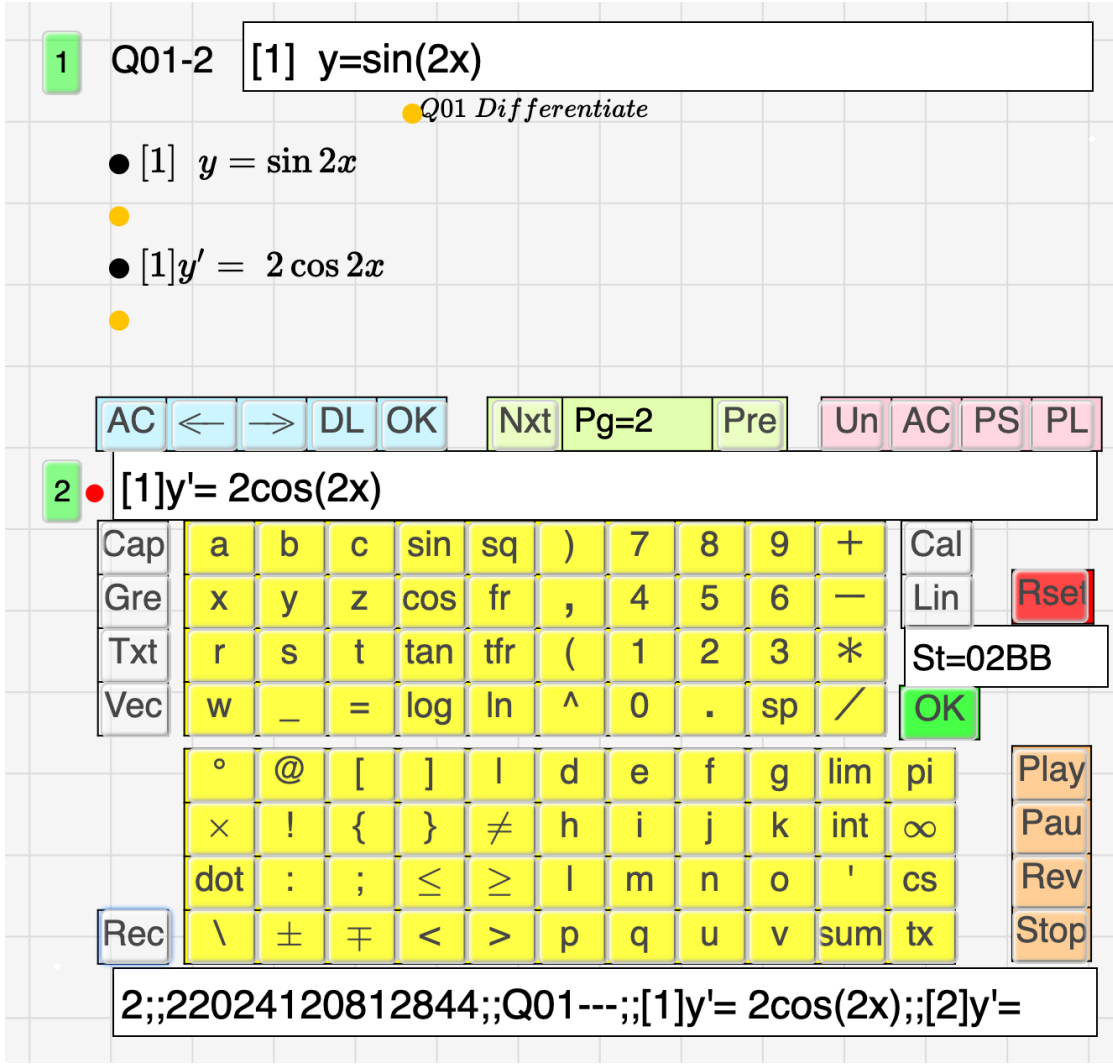


- Click and ‘2.Ketask’,select top file and ‘Go’



How to use kettask.html

Kubo has created How to Input



(1) Initial Screen
(2) St=num, Click OK
(3) Confirm StudentID
(4) Click OK again
(5) Click Nxt
(6) Input 2
(7) Input cos
(8) Input 2x
(9) Click →(? moves)
(10) Input OK
? disappears
(11) Click 'Rec'

Distributing Questions

- I upload 'kettask.html' to Github Pages.
- I distribute the URL to students by GC.
- The data is a single line of text.
- The size of the data to be uploaded is small.
- Teachers can send it at the appropriate time during the class.
- Most students use smartphones and they can immediately receive and start answering questions.

GC Question Screen

Question

Q0710-3 Answer in KeTMaTh format

Short answer

Instructions (optional)

One can write the URL directly here instead.

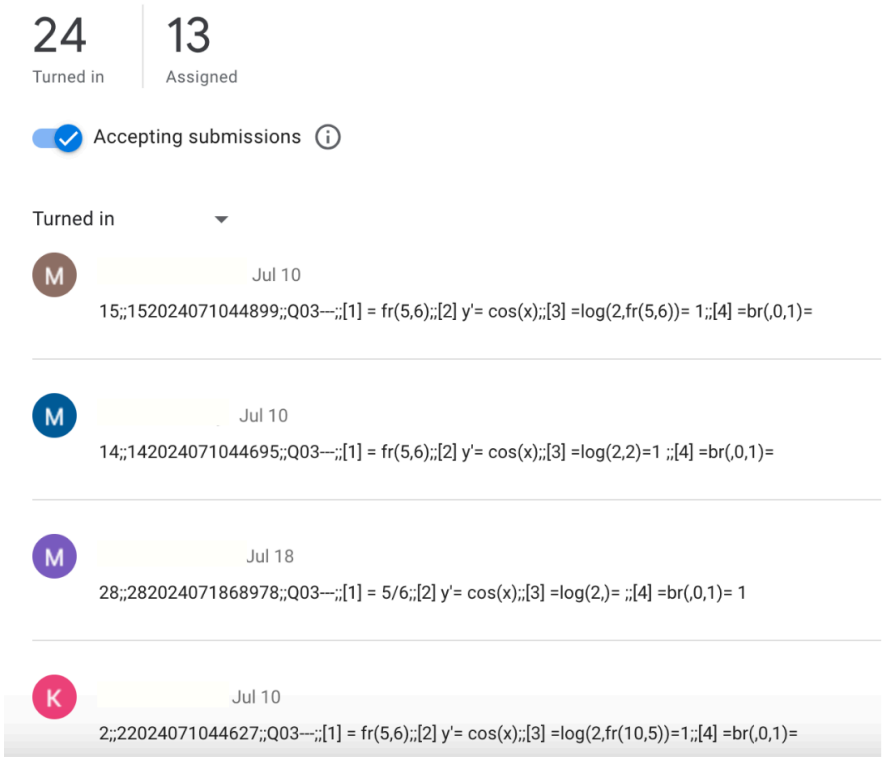
Italic

kettask0710-3

https://s-takato.github.io/specialclass/shibaura24/0710/kettaskv0710-3.html

GC Viewing

- The answers submitted are displayed in real-time on the GC.
- Teachers can view them and learn about the progress and content of the answers.



Collecting Data

- Answers are collected by simply copying them onto a pre-prepared answer sheet 'anssheetall.txt' in the folder 'data'.
- The result 'anschart.csv' can be easily generated using 'toolketmath.cdy'.
- The point is that 'anschart.csv' is a text file.

  It can be easily processed in various ways.

File anschart.csv

- The first line shows the correct answer.
- Commas are changed to ;

CA	2024	710		Q03---	[1]= fr(5:6)	2	[2]y'= cos(x)	2	[3]=log(2:fr(10:5))=log(2:2) =1	2
1	0001AC			Q03---	[1]na	0	[2]na	0	[3]na	0
2	0005AH	710	12:23:47	Q03---	[1]= fr(5:6)		[2]y'= cos(x)		[3]=log(2:fr(10:5))=1	
3	0013AH	710	12:29:54	Q03---	[1]= fr(5:6)		[2]y'= cos(x)		[3]=log(2:fr(10:5))=log(2:2) =1	
4	0028AH	710	12:23:8	Q03---	[1]= fr(5:6)		[2]y'= cos(x)		[3]=log(2:fr(10:5))= 1	
5	0034AH	710	12:25:47	Q03---	[1]= fr(5:6)		[2]y'= cos(x)		[3]=log(2:fr(10:5))=1	
6	0047AH	710	12:27:20	Q03---	[1]= fr(5:6)		[2]y'= cos(x)		[3]=log(2:2)=1	

File anschart.tex

- The following shows the answer displayed in two dimensions in TEX.

CA	2024	Q03—	$[1] = \frac{5}{6}$	2	$[2] y' = \cos x$	2	$[3] = \log_2(\frac{10}{5}) = \log_2 2 = 1$	2
1	0001AC	Q03—	$[1] na$	0	$[2] na$	0	$[3] na$	0
2	0005AH	Q03—	$[1] = \frac{5}{6}$		$[2] y' = \cos x$		$[3] = \log_2(\frac{10}{5}) = 1$	
3	0013AH	Q03—	$[1] = \frac{5}{6}$		$[2] y' = \cos x$		$[3] = \log_2(\frac{10}{5}) = \log_2 2 = 1$	
4	0028AH	Q03—	$[1] = \frac{5}{6}$		$[2] y' = \cos x$		$[3] = \log_2(\frac{10}{5}) = 1$	
5	0034AH	Q03—	$[1] = \frac{5}{6}$		$[2] y' = \cos x$		$[3] = \log_2(\frac{10}{5}) = 1$	
6	0047AH	Q03—	$[1] = \frac{5}{}$		$[2] y' = \cos x$		$[3] = \log_2 2 = 1$	

Scoring

- Although it is possible to grade using Maxima, there are some issues with responding to questions in various formats, partial marks, error handling.
- For now, it is more reliable and smoother to grade while looking at 'anschart.csv'.

Result file

- The following shows a list of grades when a final exam was conducted in a small class using KeTLMS.
- This is created using

  ‘8.Summary’ of toolketmath.

			Q01		Q02		Q03		Q04		Q05		Q06		Q07			Q08		Sum	%
			[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]	[3]	[1]	[2]		
1	01TI	OK=061715:18:6	6	6	6	6	3	6	6	6	6	0	6	6	4	6	0	6	0	79	79
2	02KZ	OK=061715:23:23	6	6	6	6	3	6	6	6	6	6	6	6	4	6	0	6	6	91	91
3	03SK	Not=1	6	6	6	3	6	6	6	6	6	0			0	3	3	0	6	63	72
4	04TK	OK=061715:55:51	6	6	6	3	6	0	6	6	3	6	0	6	4	6	3	6	6	79	79
5	05TK	OK=061714:59:25	6	6	6	6	3	6	6	6	6	6	6	6	4	6	0	6	0	85	85
6	06IS	OK=061715:11:7	6	6	6	3	6	6	6	6	6	6	0	3	4	6	0	6	6	82	82
7	07AT	Not=2	6	6					6	6	6	0	6	6	4	6	6	6	3	67	67
8	08WT	OK=061714:47:19	6	6	6	3	6	6	6	6	6	6	6	6	4	6	3	6	6	88	88
9	09YT	OK=061715:13:19	6	6	6	3	6	6	6	6	6	6	6	6	4	6	0	6	6	85	85
10	10YH	OK=061714:47:29	6	6	6	3	6	6	6	6	6	0	6	6	4	6	3	0	0	70	70
11	11YY	Not=1	6	6	6	6	3	6	6	6	6	6			4	6	3	6	0	70	80
																				Avg=	79.82

Result file

- **Creating report to to students is done through Menu 9 of toolketmath.**

```
Result of 0617ex-1
1 01TI 617 14:30:10
Q01 Transform it into the form a(x+b)^2+c.
[1] y=x^2+2x+2
Correct answer  (x+1)^2+1
Your answer  y= (x+1)^(2)+1
Your score  6
 ...
```

Embedding Script File

- KeTTask HTML files are useful for communicating mathematical formulas in a single line of text between teachers and students.
- Still, it would be more effective to include images and interactive scripts.
- For this reason, we developed ‘toolembed.cdy’.

How to embed

(1) Create a KeTTask file(01E.html for example)

(2) Create '01-1draw.txt' in the folder 'embeddata'.

(3) Change the name of the second button from Start to OS.txt.

(4) One can change its position and size by moving O and S.

(5) Push OK⇒Embed.

- I will explain with a sample file.

Conclusion

(5) Each file is tiny in size at around 150KB.

(6) The total size is about 6MB including the common library folder 'ketcindyJS' and each CSV file.

(7) This could naturally lead to paperless classroom records.

(8) Scoring with Maxima is totally future works.

Thank you for your attention