

Persona Equation 4D (iPhone/iPad/iPod touch application)

Operation manual Ver 1.5.1 (2019/ 1/31)

At the beginning: Please touch the numeric location "where you want to input or change" in the sheet. Numeric is entered. And calculation result is automatically displayed when you fill desired value. No explanation is necessary for basic calculations, I think. This manual includes only the minimum functional description.

Attention: This application is intended to modify numeric easily. Conversely, numeric may be changed by unintentionally touch. Please check by yourself carefully any value, if you use it to practical purpose. I make no warranty and can't respond to claims of any kind of damage.

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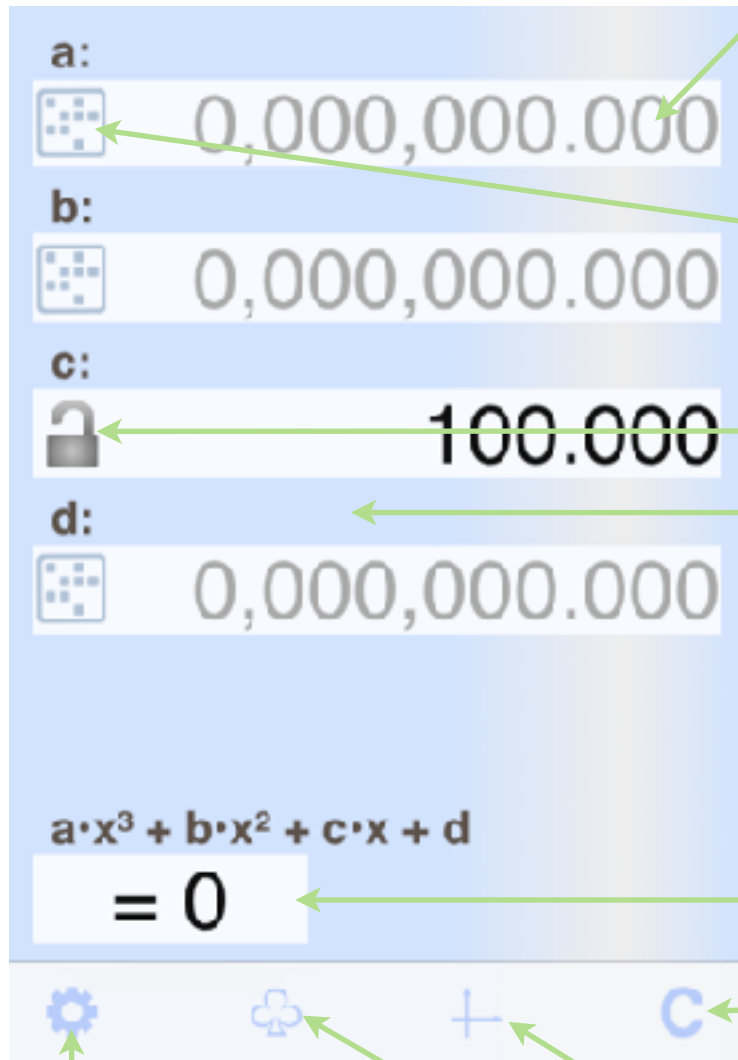
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(All figures in this manual is iPhone 3.5inch, iOS9.x)

Calculation Sheet

It provides 8 sheets and contents differ.(See P.8)
Below indicated is the common operation.



Numeric part: Thin color squares are for numerical input or calculation result display.
Input guide numeric is dimmed before entering numeric in the input section.

Touch directly the most significant digit of the numeric. The digit changes by the following action. Adjust each digit to necessary numerical values by repeatedly similar touch actions. (See P.4)

Or **Copy/Paste a numeric** (See next page) or **Keyboard** input is available.

Keyboard appears if you press the left side button. (Before numeric input. See P.6)

Where it is not the input section, a touch changes it to the input section.
However, if the combination is impossible to calculate, touch is no operation.

Button becomes 'lock' when numeric exist. You can lock the numeric by it.

Label part: Dark color behind includes label for each value.
Below operations are attached.

Change the kind of equation: Touch and move up or move down.

Sheet Change: Touch and move right or move left.

Copy/Paste a sheet: Touch and select from balloon.

(Selector is available in the case it works.)

Sheet text is stored in pasteboard. You can paste it into another application like E-mail.

When pasting, all numerical is fit to setting of the field. Locked field is skipped.

Selector: This square is a selector.

You can choose by the touch (up or down) from the defined content.

Clear this sheet numerical (excluding memory) or selected one numerical/memory.

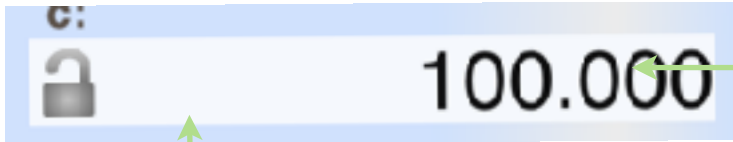
System Settings (See P.7)

Memory

Graph display

Numerical Input

The touch operation differs whether in blank or on numeric.



On numeric, value of below table is added to or subtracted from the touched digit .
When moving up or down, continuous operation is allowed, to adjust the value.
Only the touched digit is affected and other digits are kept.

In blank, right table functions are attached. However, no function except Copy/Paste works to fraction/irrational number.

	Add 1 in front of highest digit	
Insert 1 digit '0' last	Copy/Paste (See below)	Delete last 1 digit
	Switch plus and minus	

	+2(-8)	
Insert 1digit right	+1(-9)	Delete 1digit right
	+9(-1)	

Copy/Paste a numeric

- (1) Touch blank in front of the numeric you want to copy. It becomes thin color.
 - (2) Touch destination numeric field. The value (1) is copied. Or touch again same (1). The value is stored in pasteboard.
 - (3) At no input situation on the input field, by a touch blank in front of numeric guide, the value in pasteboard is pasted.
- The memory button is possible to use instead of numeric.

Calculation contents

N-VLE simultaneous equations consist from coefficient sheets (4 yellow sheets) and solution sheet (1 red sheet).

It automatically calculates the solution when you enter all coefficients.

Or, if you enter solution and all coefficients with the exception of one alphabet, it automatically calculates the coefficients of the rest.

N-degree equation consists from coefficient sheet (1 blue sheet), solution sheet (1 purple sheet) and coordinate sheet (1 green sheet).

It automatically calculates the solution when you enter all coefficients.

If there is extreme, it also automatically calculates the coordinates of the extreme.

In addition, you can also get the slope and Y-coordinate of the entered X-coordinate.

Alternatively, you can calculate the coefficient in the following two methods.

- Enter all solutions and the coefficient 'a'
- Enter 2 points coordinates of the linear equation or 3 points coordinates of the quadratic equation

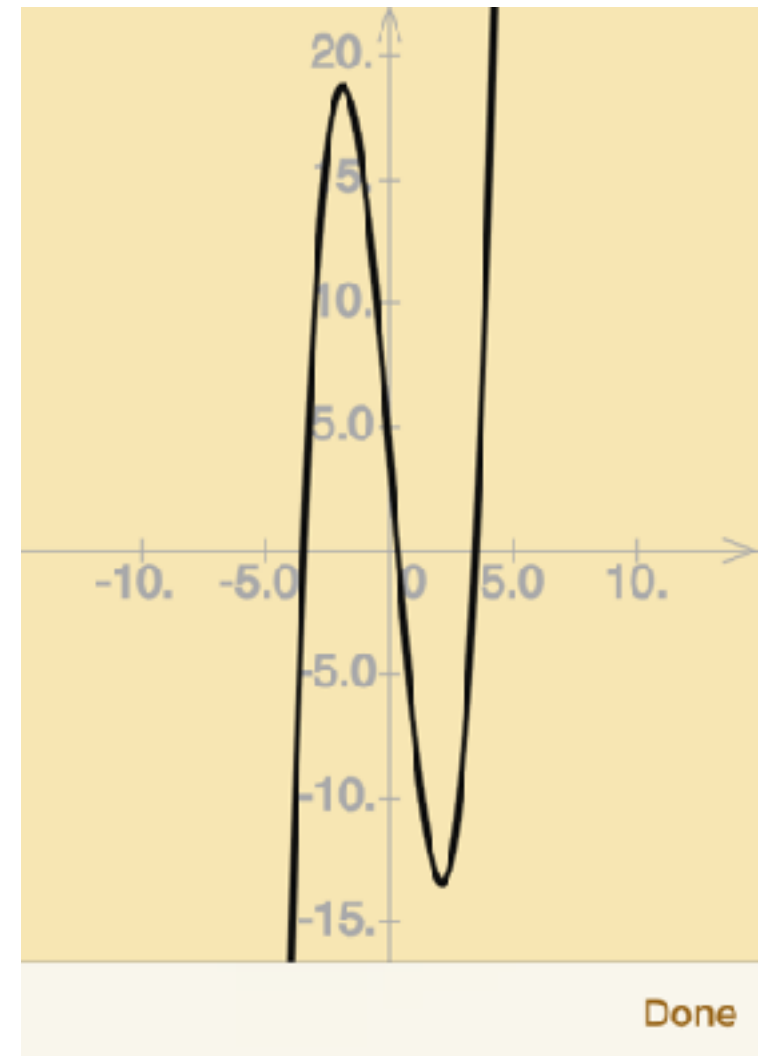
Blue sheet numeric calculated from green sheet input is fixed even if it is input field.

Inequality can be calculated by the setting of the N-degree equation coefficient sheet bottom equality. However, the input of the solution and the choice of non-equal sign can not be combined.

Outline graph of the N-degree/2-VLE simultaneous equation is displayed by pressing the graph button on toolbar .The ratio is automatically adjusted on the screen. (Right figure)

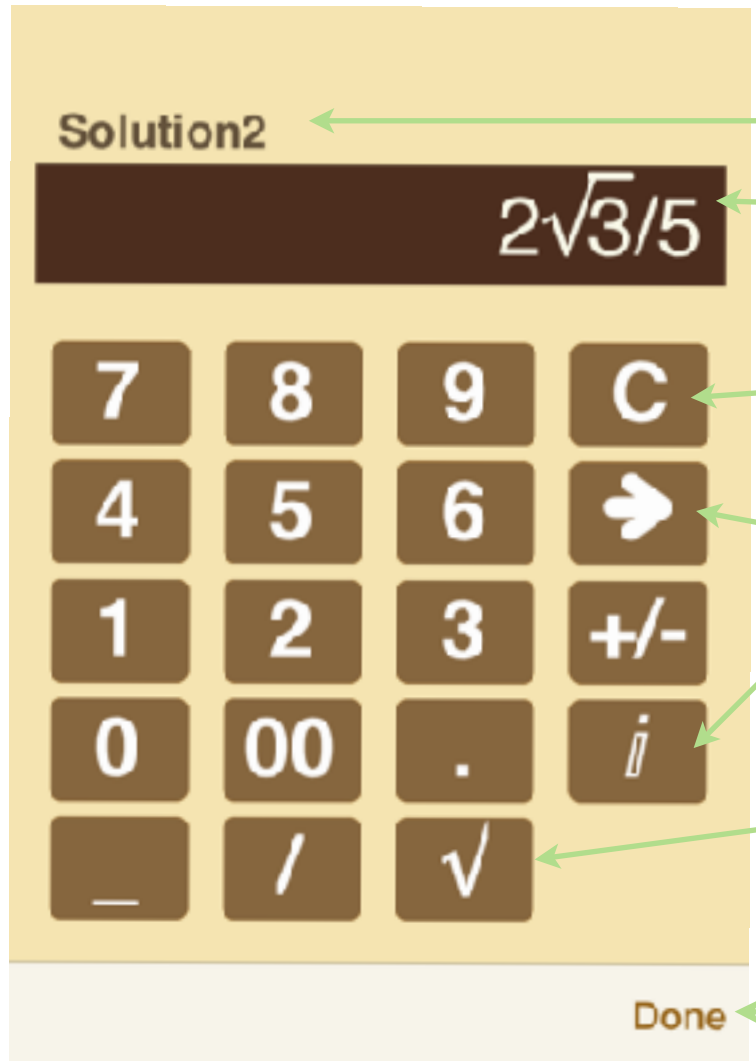
Note: It calculates numerically for the engineering use mainly.

But it equips with fraction/square root shape result display like CAS in the limit range that I think necessary for the educational use.(Example, a fractional answer in a cubic equation) CAS sometimes show the complicated expressions as a result, and I think it is not always superior.



Keyboard

2 Keyboards (Real and imaginary number) are equipped and suitable keyboard is automatically selected corresponding to the content. (Below is imaginary keyboard)



The image shows a calculator interface with a yellow background. At the top left, the text "Solution2" is displayed. Below it is a dark display area showing the mathematical expression $2\sqrt{3}/5$. The keyboard below the display has several rows of buttons: a top row with digits 7, 8, 9 and a "C" button; a second row with digits 4, 5, 6 and a right-pointing arrow button; a third row with digits 1, 2, 3 and a "+/-" button; a fourth row with digits 0, "00", ".", and an "i" button; and a bottom row with "-", "/", and a square root button. A "Done" button is located at the bottom right of the keyboard area. Green arrows point from text annotations to various parts of the interface.

Solution2 ← Label of the field.

$2\sqrt{3}/5$ ← This display numeric is stored.
Touch correction to numeric is possible.
Before storing, it is rounded according to the field setting. (P.7)
If it is blank, nothing is stored.

C ← Clear numerical input.

→ ← Delete last 1 character.

+/- ← When imaginary number display is ON (P.7), imaginary unit can be inputted in Solution2/4 key. And the imaginary part and the real part in Solution1/3 are treated as a complex number. (The relation is same in calculation results, too.)

i ← Symbol key equipped differs depending on the keyboard.
_ is a separator integer part of the mixed fraction.
/ is a separator of numerator and denominator.

Done ← Finish numeric input and **quit**.

System Settings



Switch showing **complex number solution** or not.

Rounding location is same in all numeric.
Number setting is the length of decimal part.
At '!' setting, fraction/irrational number is displayed as it is.
Decimal number is displayed with full length.

Rounding rule is same in all numeric. (Round down/Round off/Round up)

Decimal point/separator type

Blank: default of the unit
 ,, : 1,234,567,890.
 ., : 1.234.567.890,
 . : 1 234 567 890.
 , : 1 234 567 890,
 ' : 1'234'567'890.

Separator location

- : 1234567890.
 3-3-3 : 1,234,567,890.
 2-2-3 : 1,23,45,67,890.
 4-4-4 : 12,3456,7890.

Number type

20 type numerics are available and switch these by touch.

Finish this setting screen and **quit**.

Reset: Use it only when you want to initialize this application.

Reload: Return to the situation this application starts.

Attached calculations in this Application

This application is specialized to equation solver calculation. By scrolling right and left, you can switch the sheet to other sheet.

1. 2/3/4-VLE simultaneous equations coefficient 4sheets

a1:	-1.	a2:	2.	a3:	3.	a4:	1.
b1:	2.	b2:	2.	b3:	-2.	b4:	1.
c1:	3.	c2:	-3.	c3:	1.	c4:	1.
d1:	4.	d2:	-1.	d3:	-4.	d4:	1.
e1:	5.	e2:	-3.	e3:	-9.	e4:	-2.
$a1 \cdot x + b1 \cdot y + c1 \cdot z + d1 \cdot w = e1$		$a2 \cdot x + b2 \cdot y + c2 \cdot z + d2 \cdot w = e2$		$a3 \cdot x + b3 \cdot y + c3 \cdot z + d3 \cdot w = e3$		$a4 \cdot x + b4 \cdot y + c4 \cdot z + d4 \cdot w = e4$	

a1:	-1.	a2:	2.	a3:	1.
b1:	2.	b2:	3.	b3:	1.
c1:	3.	c2:	4.	c3:	1.
d1:	24.	d2:	32.	d3:	18.
$a1 \cdot x + b1 \cdot y + c1 \cdot z = d1$		$a2 \cdot x + b2 \cdot y + c2 \cdot z = d2$		$a3 \cdot x + b3 \cdot y + c3 \cdot z = d3$	

a1:	-1.	a2:	2.
b1:	2.	b2:	-3.
c1:	30.	c2:	21.
$a1 \cdot x + b1 \cdot y = c1$		$a2 \cdot x + b2 \cdot y = c2$	

2. 2/3/4-VLE simultaneous equations answer

x:	-4.
y:	3.
z:	1.
w:	-2.

x:	-5.
y:	50.
z:	-27.

x:	132.
y:	81.

By scrolling up and down, you can switch 2/3/4-VLE in the sheet.

3. equation coefficient

a: 1.
 b: 3.
 Solution -3.
 $a \cdot x + b = 0$

a: 1.
 b: 2.
 c: -3.
 $a \cdot x^2 + b \cdot x + c = 0$

a: 1.
 b: -3.
 c: -6.
 d: 8.
 $a \cdot x^3 + b \cdot x^2 + c \cdot x + d = 0$

a: 1.
 b: -6.
 c: 1.
 d: 24.
 e: -20.
 $a \cdot x^4 + b \cdot x^3 + c \cdot x^2 + d \cdot x + e = 0$

4. equation answer and slope

Solution1 -3.
 Solution2 1.
 X-coordinate 1.
 Slope $\Delta y / \Delta x$ 4.

Solution1 -2.
 Solution2 1.
 Solution3 4.
 X-coordinate 1.
 Slope $\Delta y / \Delta x$ -9.

Solution1 -2.
 Solution2 1.
 Solution3 2.
 Solution4 5.
 X-coordinate 3.
 Slope $\Delta y / \Delta x$ -24.

By scrolling up and down, you can switch linear/quadratic/cubic/biquadratic in the sheet.

5. Coordinate(pole or any X entry)

Point A x-coordinate -1.
 Point A y-coordinate -4.
 Point B x-coordinate 1.
 Point B y-coordinate 0.
 Point C x-coordinate 0,000,000,000.
 Point C y-coordinate 0,000,000,000.

Point A x-coordinate $1 - \sqrt{3}$
 Point A y-coordinate $6\sqrt{3}$
 Point B x-coordinate $1 + \sqrt{3}$
 Point B y-coordinate $-6\sqrt{3}$
 Point C x-coordinate 1.
 Point C y-coordinate 0.

Point A x-coordinate -1.
 Point A y-coordinate -36.
 Point B x-coordinate $1 \frac{1}{2}$
 Point B y-coordinate $3 \frac{1}{16}$
 Point C x-coordinate 4.
 Point C y-coordinate -36.

Modification history

Modifications → Ver1.4.0

- iOS8/9 adaptation.
 - Rise Landscape view to basic function (+ i-Pad multitask).
 - Handoff.
- The function after tweet changes. (Left-handed keyboard and customise of guidance.)
- Right/left operations on numeric change to delete/insert.
- Touch operation on keyboard numeric is allowed.
- Fix bug (Some biquadratic equation couldn't solve though it has answer.)
- Improvement of some operation.
- Some bug fix.

Modifications → Ver1.4.1

- Bug fixes from Ver. 1.4. There were some cases answer wasn't shown.
- Graph problem of $X=\text{constant}$ or $Y=\text{constant}$ case.
- Arabic/Hebrew label message.
- iPad Pro icon
- Some improvement of usability.

Modifications → Ver1.4.2

- Bug fix which imaginary number answer input is not held at application restart.
- Fix bug Ver. 1.4.1(Biquadratic equation couldn't solve though it has answer.)

Modifications → Ver1.5

- Bug fix of the graph view crash case.
- Bug fix of the case the slope didn't calculate.
- Delete twitter button because iOS11 or after doesn't support it.
- iPhoneX/XR/XS display.

Modifications → Ver1.5.1

- Bug fix of 4-VLE simultaneous equations coefficient-b calculator error
- Bug fix of linear equation answer disappear case
- Holding non-decimal number format of inequity answer