Activity 37 Complex solutions

Aim: Appreciate complex solutions.

Setup

- In Main
- Set ClassPad to Standard and Real
- Select [Interactive | Define] to define functions

  $f(x) = x^2$,

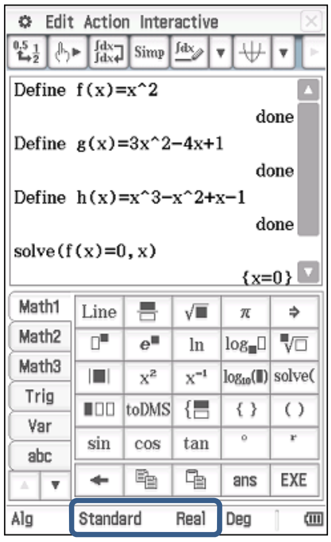
  $g(x) = 3x^2 - 4x + 1$ and

  $h(x) = x^3 - x^2 + x - 1$

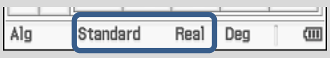
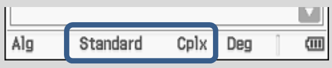
Use solve to find solutions to an equation

- Select [Action | Advanced | Solve]

  or tap solve(from the keyboard menu Math1



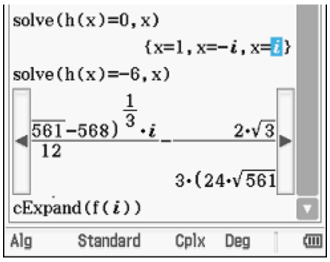
1. Complete the table

	Equation	ClassPad in Real mode 	ClassPad in Complex mode 
a)	$f(x) = 1$		
b)	$f(x) = -1$		
c)	$g(x) = 0$		
d)	$g(x) = -1$		
e)	$h(x) = 0$		
f)	$h(x) = 5$		

2. Some of the solutions involved the number i. These are complex numbers where $i = \sqrt{-1}$.

Substitute back into the function e.g. $f(-i)$

- Highlight an answer ($-i$)
- Select [Edit | Copy]
- Scroll down to a new line
- Enter f(
- Select [Edit | Paste]
- Press EXE
- Tap at the beginning of the line
- Select [Action | Complex | cExpand]
- Press EXE.



Verify the ClassPad output from Q1 parts b), e) and f) are solutions.

I.e. for c) check that *f*(each solution to $f(x) = -1$) is –1.

In the previous activity you derived the solution to the general quadratic equation. What happens if the square root part is negative? It turns out to be useful to do so by defining $i = \sqrt{-1}$.

3. Solve the equations below using the general quadratic equation. Give your answer in the form $a \pm bi$, and then check by solving on ClassPad.

a) $f(x) = -5$

b) $g(x) = -5$

Learning notes

ClassPad needs to be in Complex mode to work with complex numbers.

Q1 There is no need to re-enter the equations

Set ClassPad to Complex mode • Tap Real at the bottom of the screen to toggle to Complex (Cplx) mode. • Scroll up to the first calculation and press EXE	

You may like to do some research on the history of complex numbers. Initially they were “invented” for completeness, i.e. so the quadratic had solutions. It then turned out that they are very useful.

The activity uses a cubic function, not expected to be solved by hand, to indicate that complex numbers arise from more than just the quadratic equation.