

Complex Numbers in TI-83/84

Your calculator can do basic arithmetic using complex numbers. To activate this feature, select

MODE and scroll down to the line that begins with **REAL**.

Scroll over to $a + bi$ and press **ENTER**. When $a + bi$ is highlighted, press **2nd** **MODE** for **QUIT** to return to the main screen.

```

MATHPRINT CLASSIC
NORMAL SCI ENG
FLOAT 0 1 2 3 4 5 6 7 8 9
RADIAN DEGREE
FUNCTION PARAMETRIC POLAR SEQ
THICK DOT-THICK THIN DOT-THIN
SEQUENTIAL SIMUL
REAL a+bi re^(θi)
FULL HORIZONTAL GRAPH-TABLE
FRACTION TYPE: FRD Un/d
ANSWERS: AUTO DEC FRAC-APPROX
GO TO 2ND FORMAT GRAPH: NO YES
STAT DIAGNOSTICS: OFF ON
STAT WIZARDS: ON OFF
SET CLOCK 12/23/16 9:22PM
    
```

Once turned on, you can leave it on as it will not affect operations on real numbers at all.

Let's try some examples.

Suppose I want to add $(4 + 3i) + (5 - 2i)$. You can type the expression in exactly as it's written. To

get i , press **2nd** **.**

```

(4+3i)+(5-2i)
.....9+i
    
```

We can also perform operations like multiplication and powers.

Find the value of $(3 - i)^2 + (3 + i)$.

We can use this, and the ANS feature to find sequences of values of the Mandelbrot set.

```

(3-i)^2+(3+i)
.....11-5i
    
```

Recall the formula defining the Mandelbrot set is given by $s_{N+1} = s_N^2 + s$. Let's use the seed value $s = \frac{1}{2} - \frac{5}{6}i$.

Enter this value into the calculator.

```

1/2-5/6i
......5-.833333333333i
    
```

Since the formula is recursive, we are going to use the output value to obtain the new input value. Press

2nd **(-)** (for **ANS**), then **x²** **+** and the original seed value $\frac{1}{2} - \frac{5}{6}i$.

Then just keep hitting **ENTER** to get your sequence. Each time the formula is calculated, it will use the answer you obtained at the last step.

We can see that this point is not in the Mandelbrot set since the values of the number keep getting bigger and bigger.

```

Ans^2+1/2-5/6i
......05555555556-1.666666667i
Ans^2+1/2-5/6i
.....-2.274691358-1.018518519i
Ans^2+1/2-5/6i
.....4.636840802+3.800297211i
Ans^2+1/2-5/6i
.....7.55803373+34.409413i
    
```