

Working with Complex Numbers on the TI-85 and TI-86
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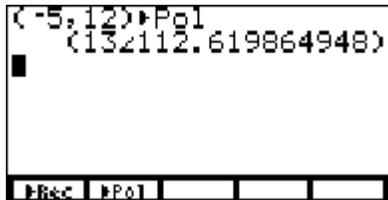
IMPORTANT!: Always make sure you are aware of what mode (degrees or radians) your calculator is in before doing any type of math involving angular measurements. For the purposes of these instructions, your calculator should be set to degrees since electrical engineering problems normally give angular measurements in degrees. This setting is changed from the mode screen accessed by pressing **2nd****[MORE]**.

Converting from rectangular form to polar form:

To go from $x + jy$ form to M/θ form

1. Enter the rectangular number as (x,y)
2. From the portion of the complex number menu accessed by **2nd****[9]****[MORE]**, select the \rightarrow Pol function by pressing **[F2]**.
3. Press **[ENTER]** for the result which will display as (M/ θ).

Example: $-5 + j12$ to polar



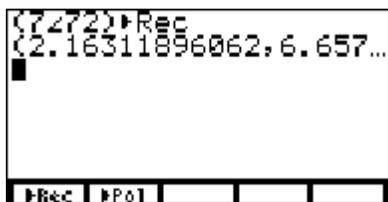
$$-5 + j12 \approx 13/113^\circ$$

Converting from polar form to rectangular form:

To go from M/θ form to $x + jy$ form

1. Enter the polar number as (M/ θ). (note: the \angle symbol is accessed from **2nd****[,]**)
2. From the portion of the complex number menu accessed by **2nd****[9]****[MORE]**, select the \rightarrow Rec function by pressing **[F1]**.
3. Press **[ENTER]** for the result which will display as (x,y).

Example: $7/72^\circ$ to rectangular



$$7/72^\circ \approx 2.16 + j6.66$$

note: if not all of y is visible, scroll over using the **[▶]** key

Complex math operations:

The TI-85 and TI-86 can simplify complex math expressions directly. The form in which it outputs the result can be determined by changing the appropriate setting on the mode screen.

The mode screen is accessed by pressing **2nd** **MORE**.

```
Normal Sci Eng
Float 012345678901
Radian Degree
RectC PolarC
Func Pol Param Dife
Dec Bin Oct Hex
RectC Cyl SphereU
dxDer1 dxNDer
```

Here you can change many useful settings including whether angles are specified in radians or degrees and whether rectangular or polar coordinates are being used. To make the calculator simplify complex expressions to rectangular coordinates, highlight RectC and press **ENTER**. To make the calculator simplify complex expressions to polar coordinates, highlight PolarC and press **ENTER**. To return to the home screen press **EXIT**.

To simplify a complex math expression, simply type it directly into the calculator making sure to use parentheses appropriately to separate operations. **Remember**, graphing calculators follow order of operations on any expression that you type into them. Make sure that the operations you want done first are enclosed in the deepest parentheses.

To simplify an expression such as $(6/19^\circ)(40 + j51)/[(2 - j7)(5/-147^\circ)]$ simply enter it as shown below and press **ENTER** for the result.

```
((6/19)*(40,51))/((2,
-7)*(5/-147))
(3.993005707, -9.9094...
```

The result is approximately $3.99 - j9.91$ in rectangular coordinates. If the calculator was set in polar coordinates the display would look like the one below and the answer would be approximately $10.68/-68^\circ$.

```
((6/19)*(40,51))/((2,
-7)*(5/-147))
(10.68365000172,-68.0...
```