

Chapter 10 / **Example 3****Cartesian and polar form**

Write the following complex numbers in Cartesian form. Check your answer by using technology.

a $2\text{cis}\frac{\pi}{3}$ **b** $5e^{i\frac{3\pi}{4}}$ **c** $8\text{cis}\frac{11\pi}{6}$ **d** $e^{i\frac{17\pi}{12}}$

On the TI-84 Plus C complex numbers cannot be entered in polar form, just in Euler's form, therefore you should rewrite

$2\text{cis}\frac{\pi}{3}$ as $2e^{i\frac{\pi}{3}}$.

Type $2e^{i\frac{\pi}{3}}$ using $\boxed{2\text{nd}} \boxed{\ln} \boxed{[e^x]} \boxed{[i]}$ and press $\boxed{\text{enter}}$.

Use the fraction template by pressing $\boxed{\text{ALPHA}} \boxed{[f1]} 1:n/d$.

TI-84 Plus C calculator screen showing the input $2e^{i\frac{\pi}{3}}$ and the resulting Cartesian form $1+1.732050808i$.

Since the default format of complex numbers is Cartesian, the GDC converts from polar to Cartesian without needing to enter any additional command.

$2\text{cis}\frac{\pi}{3} = 1 + 1.73i$.

TI-84 Plus C calculator screen showing the input $2e^{i\frac{\pi}{3}}$ and the resulting Cartesian form $1+1.732050808i$.

Type $5e^{i\frac{3\pi}{4}}$ and press $\boxed{\text{enter}}$.

$5e^{i\frac{3\pi}{4}} = -3.54 + 3.54i$.

TI-84 Plus C calculator screen showing the input $5e^{i\frac{3\pi}{4}}$ and the resulting Cartesian form $-3.535533906+3.535533906i$.

Type $8e^{i\frac{11\pi}{6}}$ and press $\boxed{\text{enter}}$.

$8e^{i\frac{11\pi}{6}} = 6.93 - 4i$.

TI-84 Plus C calculator screen showing the input $8e^{i\frac{11\pi}{6}}$ and the resulting Cartesian form $6.92820323-4i$.

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Type $e^{i \times \frac{17\pi}{12}}$ and press **enter**.

$$e^{i \frac{17\pi}{12}} = -0.259 - 0.966i.$$

The calculator screen displays the following steps and results:

- Input: $i \times \frac{17\pi}{12}$
- Result: $5e^{-3.535533906+3.535533906i}$
- Input: $8e^{i \times \frac{11\pi}{6}}$
- Result: $6.92820323-4i$
- Input: $e^{i \times \frac{17\pi}{12}}$
- Result: $-.2588190451-.9659258263i$