Chapter 10 / **Example 19**

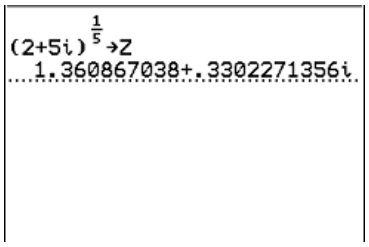
Finding roots of a complex number

Use your calculator to find all the solutions of the equation $z^5 = 2 + 5\mathrm{i}$ in Cartesian form.

Find the fifth root of $2 + 5\mathrm{i}$ and store it as Z.

To enter $\sqrt[5]{2+5\mathrm{i}}$ type $(2+5\mathrm{i})^{\frac{1}{5}}$, press STO▶ ALPHA Z and press ENTER.

Use the fraction template by pressing ALPHA [f1] 1:n/d.

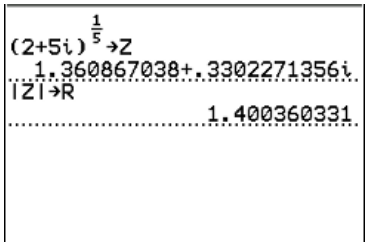


Where $z = r\,\mathrm{cis}\,\theta$, $\sqrt[n]{z} = \sqrt[n]{r}\,\mathrm{cis}\,\frac{\theta + 2k\pi}{n}, k = 0, 1, 2, \ldots n-1$.

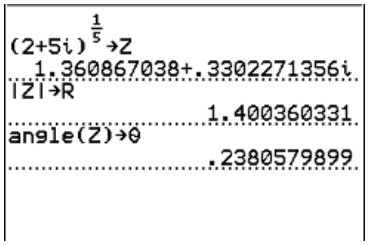
Find r and store it by typing $|Z|$ STO▶ ALPHA R and press ENTER.

To enter the modulus function press math ▶ NUM 1:abs(.

To enter i press 2nd . [i].



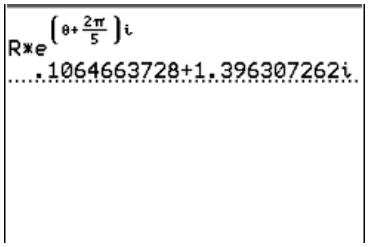
Find θ and store it. Press math ▶ ▶ CMPLX 4:angle(, type ALPHA Z, close the parentheses, type STO▶ ALPHA θ and press ENTER.



Now use the formula for arguments to find all the solutions and convert these to Cartesian form.

Type $r \times e^{\left(\theta + \frac{2\pi}{5}\right)\mathrm{i}}$.

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



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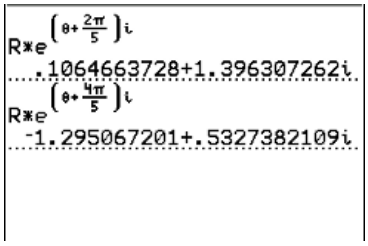
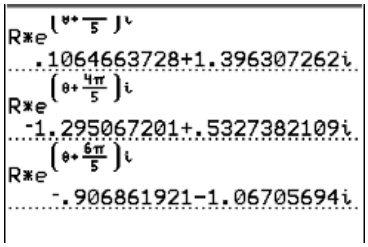
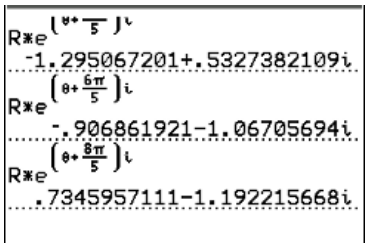
Chapter 10 / **Example 19**

Finding roots of a complex number

To repeat this calculation, select it and press ENTER. Edit the expression, changing 2 to 4 and press ENTER.	
Repeat changing 4 to 6 and press ENTER.	
Repeat changing 6 to 8 and press ENTER. $z_1 = 1.36 + 0.330\text{i}$, $z_2 = 0.106 + 1.40\text{i}$, $z_3 = -1.30 + 0.533\text{i}$, $z_4 = -0.907 - 1.07\text{i}$, $z_5 = 0.735 - 1.19\text{i}$.	

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