Review Problems, by request

- Polar forms of complex numbers

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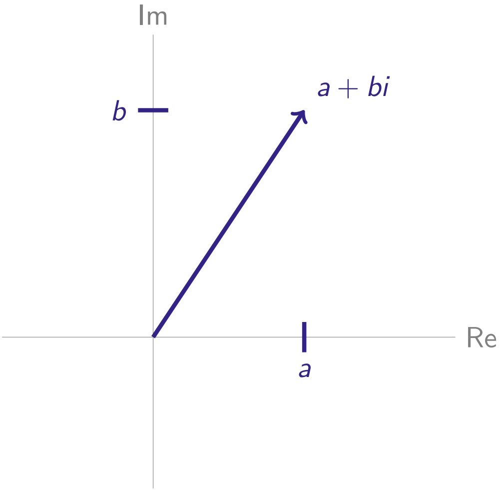

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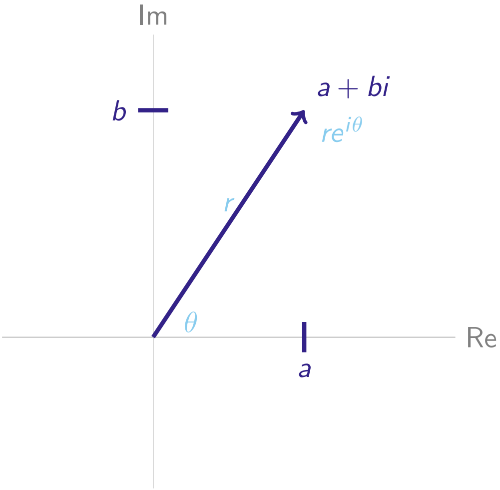

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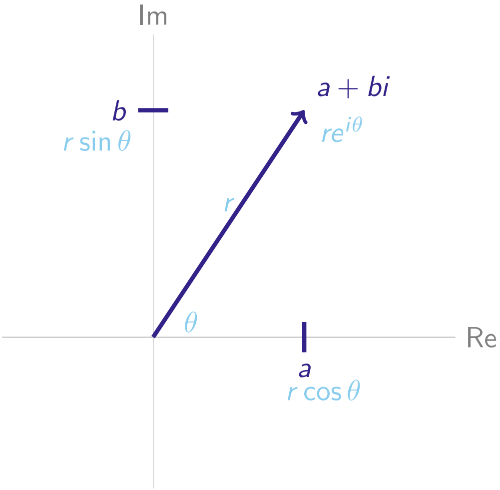

Polar $\rightarrow a + bi$

$$e^{i\theta} = \cos\theta + i\sin\theta$$

- $e^{\frac{\pi i}{3}}$
- $10e^{\frac{\pi i}{3}}$
- $7e^{5i}$

Polar $\rightarrow a + bi$

$$e^{i\theta} = \cos\theta + i\sin\theta$$

- $e^{\frac{\pi i}{3}} = \cos(\pi/3) + i\sin(\pi/3) = \frac{1}{2} + i\frac{\sqrt{3}}{2}$
- $10e^{\frac{\pi i}{3}}$
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- $10e^{\frac{\pi i}{3}} = 5 + 5\sqrt{3}i$
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Polar $\to a + bi$

$$e^{i\theta} = \cos\theta + i\sin\theta$$

- $e^{\frac{\pi i}{3}} = \cos(\pi/3) + i\sin(\pi/3) = \frac{1}{2} + i\frac{\sqrt{3}}{2}$

- $10e^{\frac{\pi i}{3}} = 5 + 5\sqrt{3}i$

- $7e^{5i} = 7\cos 5 + 7i\sin 5$

$a + bi \to$ polar

$$e^{i\theta} = \cos\theta + i\sin\theta$$

- i

- $-2 + 2i$

- $3 + 7i$

- $-3 - 7i$

$a + bi \to$ polar

$$e^{i\theta} = \cos\theta + i\sin\theta$$

- $i = e^{\pi i/2}$

- $-2 + 2i$

- $3 + 7i$

- $-3 - 7i$

$a + bi \rightarrow$ polar

$$e^{i\theta} = \cos\theta + i\sin\theta$$

- $i = e^{\pi i/2}$
- $-2 + 2i = 2\sqrt{2}e^{3\pi i/4}$
- $3 + 7i$
- $-3 - 7i$

$a + bi \to$ polar

$$e^{i\theta} = \cos\theta + i\sin\theta$$

- $i = e^{\pi i/2}$
- $-2 + 2i = 2\sqrt{2}e^{3\pi i/4}$
- $3 + 7i = \sqrt{58}e^{i\arcsin\left(\frac{7}{\sqrt{58}}\right)}$
- $-3 - 7i$

$a + bi \rightarrow$ polar

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$a + bi \to$ polar

$$e^{i\theta} = \cos\theta + i\sin\theta$$

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- For any real number R, $R = Re^{2\pi i} = Re^{4\pi i} = Re^{6\pi i}$, etc.

Solving Roots using Polar Form

Find all solutions.

- $z^3 = 1$
- $z^5 = 32$
- $z^{15} = 100$
- $z^7 = 3$
- $z^4 + 2z^2 = 0$

Solving Roots using Polar Form

Find all solutions.

- $z^3 = 1$ $\left\{1,\ e^{\frac{2\pi}{3}i},\ e^{\frac{4\pi}{3}i}\right\}$
- $z^5 = 32$
- $z^{15} = 100$
- $z^7 = 3$
- $z^4 + 2z^2 = 0$

Solving Roots using Polar Form

Find all solutions.

- $z^3 = 1$ $\left\{1,\ e^{\frac{2\pi}{3}i},\ e^{\frac{4\pi}{3}i}\right\}$
- $z^5 = 32$ $\left\{2,\ 2e^{\frac{2\pi}{5}i},\ 2e^{\frac{4\pi}{5}i},\ 2e^{\frac{6\pi}{5}i},\ 2e^{\frac{8\pi}{5}i}\right\}$
- $z^{15} = 100$
- $z^7 = 3$
- $z^4 + 2z^2 = 0$

Solving Roots using Polar Form

Find all solutions.

- $z^3 = 1$ $\left\{1,\ e^{\frac{2\pi}{3}i},\ e^{\frac{4\pi}{3}i}\right\}$

- $z^5 = 32$ $\left\{2,\ 2e^{\frac{2\pi}{5}i},\ 2e^{\frac{4\pi}{5}i},\ 2e^{\frac{6\pi}{5}i},\ 2e^{\frac{8\pi}{5}i}\right\}$

- $z^{15} = 100$
  $\left\{\sqrt[15]{100},\ \ \sqrt[15]{100}e^{\frac{2\pi}{15}i},\ \ \sqrt[15]{100}e^{\frac{4\pi}{15}i},\ \ \sqrt[15]{100}e^{\frac{6\pi}{15}i}, \cdots,\ \ \sqrt[15]{100}e^{\frac{28\pi}{15}i}\right\}$

- $z^7 = 3$

- $z^4 + 2z^2 = 0$

Solving Roots using Polar Form

Find all solutions.

- $z^3 = 1$ $\left\{1,\ e^{\frac{2\pi}{3}i},\ e^{\frac{4\pi}{3}i}\right\}$

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- $z^{15} = 100$
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- $z^7 = 3$
  $\left\{\sqrt[7]{3},\ \sqrt[7]{3}e^{\frac{2\pi}{7}i},\ \sqrt[7]{3}e^{\frac{4\pi}{7}i},\ \sqrt[7]{3}e^{\frac{6\pi}{7}i},\ \sqrt[7]{3}e^{\frac{8\pi}{7}i},\ \sqrt[7]{3}e^{\frac{10\pi}{7}i},\ \sqrt[7]{3}e^{\frac{12\pi}{7}i}\right\}$

- $z^4 + 2z^2 = 0$

Solving Roots using Polar Form

Find all solutions.

- $z^3 = 1$ $\left\{1,\ e^{\frac{2\pi}{3}i},\ e^{\frac{4\pi}{3}i}\right\}$

- $z^5 = 32$ $\left\{2,\ 2e^{\frac{2\pi}{5}i},\ 2e^{\frac{4\pi}{5}i},\ 2e^{\frac{6\pi}{5}i},\ 2e^{\frac{8\pi}{5}i}\right\}$

- $z^{15} = 100$
  $\left\{\sqrt[15]{100},\ \sqrt[15]{100}e^{\frac{2\pi}{15}i},\ \sqrt[15]{100}e^{\frac{4\pi}{15}i},\ \sqrt[15]{100}e^{\frac{6\pi}{15}i},\cdots,\ \sqrt[15]{100}e^{\frac{28\pi}{15}i}\right\}$

- $z^7 = 3$
  $\left\{\sqrt[7]{3},\ \sqrt[7]{3}e^{\frac{2\pi}{7}i},\ \sqrt[7]{3}e^{\frac{4\pi}{7}i},\ \sqrt[7]{3}e^{\frac{6\pi}{7}i},\ \sqrt[7]{3}e^{\frac{8\pi}{7}i},\ \sqrt[7]{3}e^{\frac{10\pi}{7}i},\ \sqrt[7]{3}e^{\frac{12\pi}{7}i}\right\}$

- $z^4 + 2z^2 = 0$ $\{0, \sqrt{2}i, -\sqrt{2}i\} = \left\{0, \sqrt{2}e^{\frac{\pi i}{2}}, \sqrt{2}e^{\frac{3\pi i}{2}}\right\}$