

# COMPLEX ANALYSIS

**This lecture will be recorded. If you do not want your face in the recording, please turn off your camera. If you do not want your voice in the recording, please participate using the chat.**

# CHECK IN

Any questions or concerns? Anything unclear?

office hours: Monday noon - 1pm

Wednesday 3pm - 5pm

also Campuswire (post your questions)

# WARM UP CHECK IN

• Request for #3

a) polar form of  $1+i$

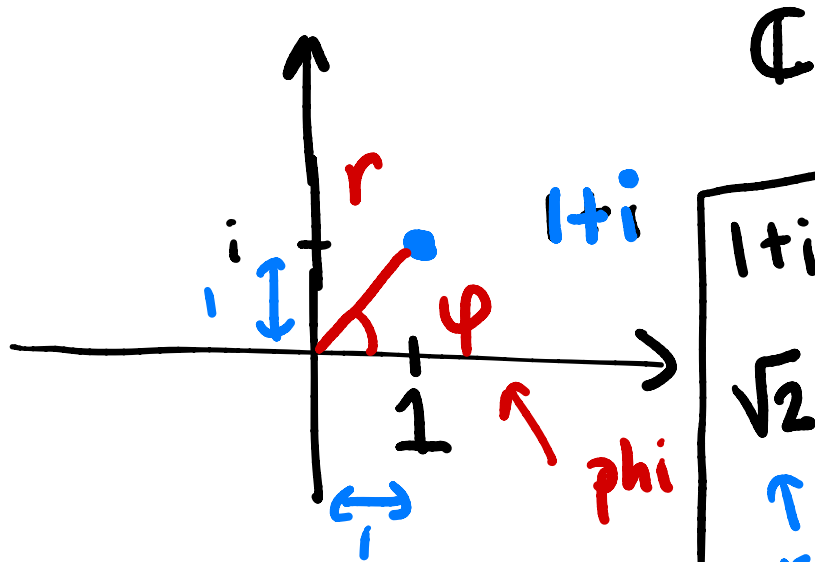
to find  $r$



$$r^2 = 1^2 + 1^2$$

$$r^2 = 2$$

$$r = \sqrt{2}$$



$\mathbb{C}$

to find  $\varphi$

$$1+i =$$

$$\sqrt{2} e^{i\pi/4}$$

$$\varphi = 45^\circ$$

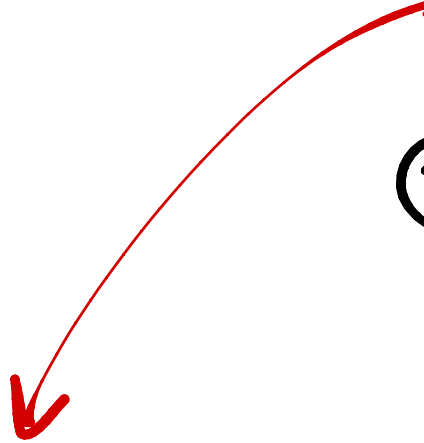
$$= \frac{\pi}{4} \text{ Radians}$$

$$c) \left( \frac{1-i}{\sqrt{3}} \right)^4$$

2 ways to find polar form

① <sup>harder</sup> raise to the fourth, then compute the polar form

② compute the polar form then raise to the fourth  
easier


$$\left( \frac{1-i}{\sqrt{3}} \right) \left( \frac{1-i}{\sqrt{3}} \right) \left( \frac{1-i}{\sqrt{3}} \right) \left( \frac{1-i}{\sqrt{3}} \right) = \frac{1}{9} \underbrace{(1-i)(1-i)(1-i)(1-i)}$$

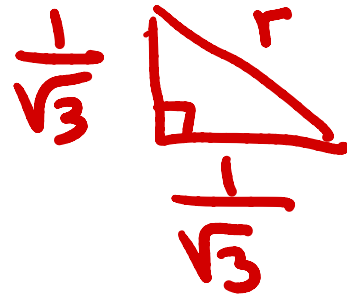
FOR +, - : rectangular form is good  
 FOR x, ÷ : polar form is easier

$$\varphi = \frac{\pi}{2} + \frac{\pi}{2} + \frac{\pi}{2} + \frac{\pi}{4}$$

$$= \frac{7\pi}{4}$$

$$\frac{1-i}{\sqrt{3}} = \frac{1}{\sqrt{3}} - \frac{1}{\sqrt{3}}i$$

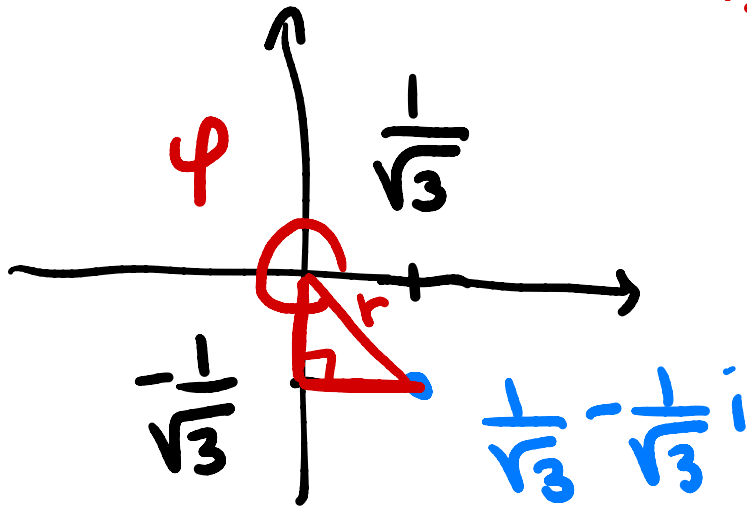
Compute r



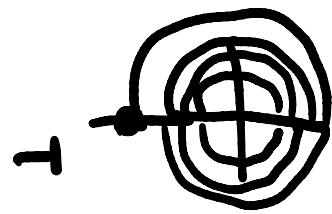
$$r^2 = \left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2$$

$$r^2 = \frac{1}{3} + \frac{1}{3}$$

$$r = \frac{\sqrt{2}}{\sqrt{3}} = \sqrt{\frac{2}{3}}$$



$$\frac{1-i}{\sqrt{3}} = \sqrt{\frac{2}{3}} e^{i\frac{7\pi}{4}}$$



$$\left(\frac{1-i}{\sqrt{3}}\right)^4 = \left(\sqrt{\frac{2}{3}} e^{i\frac{7\pi}{4}}\right)^4 = \frac{4}{9} e^{i\pi}$$

*x times*

$$= \left(\sqrt{\frac{2}{3}}\right)^4 \cdot \left(e^{i\frac{7\pi}{4}}\right)^4$$

$$= \frac{4}{9} e^{i7\pi}$$

this is ok

$\frac{4}{9}$  not  
polar  
form

# LIGHTNING ROUND 1

What is  $i^3$ ?

# LIGHTNING ROUND 1 ANSWER

$$i^3$$

a.  $i$

b.  $-1$

c.  $-i$

d. Don't know





# LIGHTNING ROUND 2

Write  $i$  in polar form.

# LIGHTNING ROUND 2 ANSWER

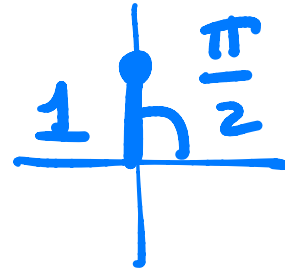
$i$  in polar form

a.  $1e^{i\pi/2}$

b.  $e^{i\pi}$

c.  $e^{-i\pi}$

d. Don't know





# LIGHTNING ROUND 3

Write  $e^{i\pi}$  in rectangular form.

# LIGHTNING ROUND 3 ANSWER

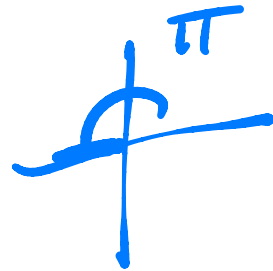
$1e^{i\pi}$  in rectangular form

a.  $i$

b.  $-i$

c.  $-1$

d. Don't know





# PEER INSTRUCTION REMINDERS

What it is:

- Time to socialize with peers in the class
- Time to check understanding of basic concepts with peers
- Time to share studying tips, mnemonic devices to remember theorems and definitions, time to offer help to each other
- Time to explore a new math problem together
- Time to solidify concepts by applying them and obtaining feedback from peers



# PEER INSTRUCTION: EVERYONE BELONGS IN CLASS

On “off” days you can:

- Sit back and relax!
- Offer to take notes for the group, and present the notes to the whole class when we reconvene
- Help organize the discussion by recapping what everyone has said at various intervals
- Help peers take turns speaking, make sure that everyone who wants to speak gets a turn
- Look up definitions and theorems

# PEER INSTRUCTION PROBLEM 1

Find all solutions to the following equations:

a.  $z^6 = 1$

b.  $z^6 = -9$



## PEER INSTRUCTION PROBLEM 2

Let  $z$  and  $w$  be two complex numbers. Prove that  $zw = 0$  implies that  $z = 0$  or  $w = 0$ .



THAT'S ALL FOR TODAY!