notes: I put on website of canvas.

201109: 2DL40 instr.

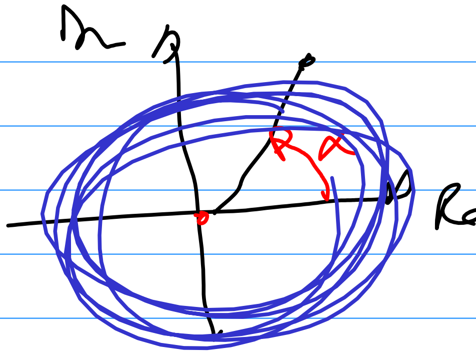
- You can ask questions, but this a little bit to see if everything works, for you and me.

The sentence I will write next, I will put away after some time:

Have you search on z-lib?

→ adams solution manual calculus complete course 7th (8th!?) I see nothing of 9th ed.

Principle argument



$$\begin{cases} \arg(z) = \alpha + k \cdot 2\pi \\ \mathrm{Arg}(z) = \alpha \end{cases}$$

$$\underbrace{(-\pi < \mathrm{Arg}(z) \leq \pi)}$$

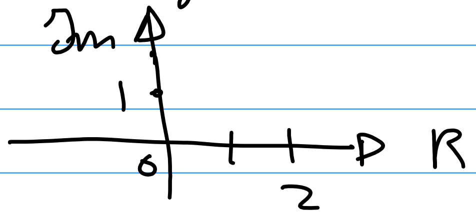
our deal is that

Read always what other people use for it, often used:

$$0 \leq \mathrm{Arg}(z) < 2\pi$$

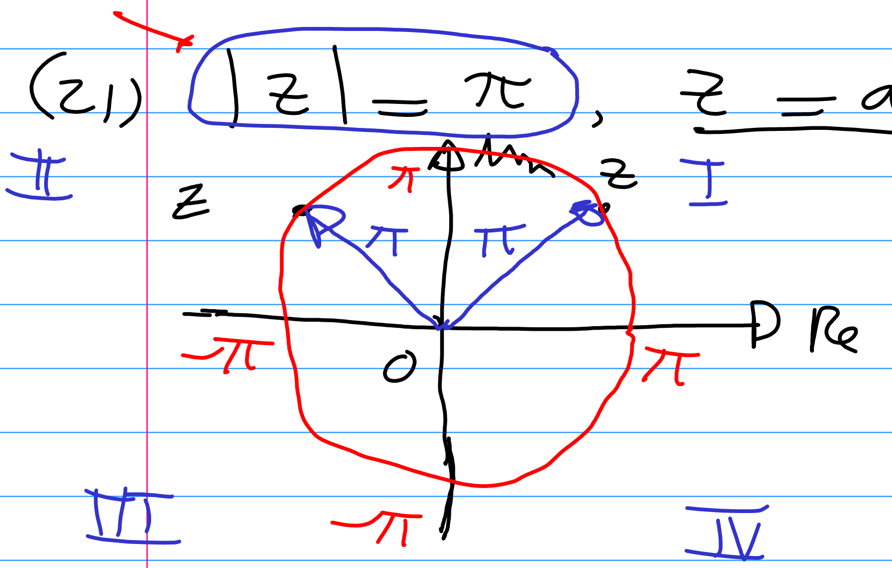
$(2 > i \;\; X)$

$(\& \; |2| > |i| = 1)$



I put a lot of old exams on canvas.
Also a way to do the instructions.
But I can't find old exams of 2019?
No idea, where I have put them.

(21) $\boxed{|z| = \pi}$, $\underline{z = a + ib}$



$M = (0,0)$

$$\boxed{a^2 + b^2 = \pi^2}$$

$\varphi = \arg(z)$

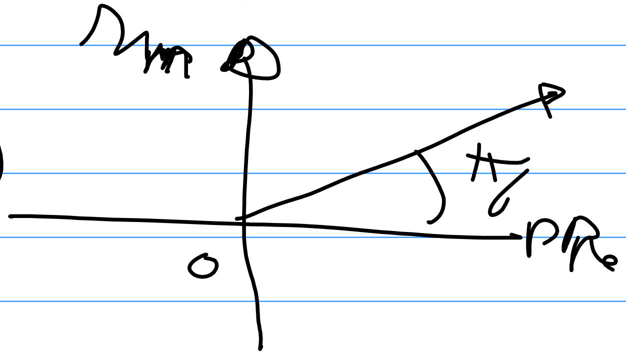
$$\left|\frac{z}{\pi}\right| =$$

$$|z| = \pi \qquad \left|\frac{z}{\cancel{\pi}}\right| = \underline{1} \rightarrow \text{unit circle}$$

$$\frac{z}{\pi} = (\cos(\varphi) + i\sin(\varphi))$$

$$\begin{cases} z = \underbrace{(\pi\cos(\varphi))}_{a} + i\underbrace{(\pi\cdot\sin(\varphi))}_{b} \\ \underline{\varphi \in \mathbb{R}} \end{cases}$$

$(\arg(z) = \frac{\pi}{6})$



only simple calculators aloud during test, and I want to have the exact solutions, so I don't want to see 1.73..., but $\sqrt{3}$

(If 1.73... has something to do with $\sqrt{3}$??)

Also π and not 3,14.... and go so on.

$\cos\left(\frac{\pi}{6}\right) = \frac{1}{2}\sqrt{3}$, $\sin\left(\frac{\pi}{4}\right) = \frac{1}{2}\sqrt{2}$ ....

(4 5)

$$\overline{\left(\frac{z}{w}\right)} = \left(\frac{\bar{z}}{\bar{w}}\right)$$

a possibility

polar coordin:

$$z = |z| \cdot \exp(i\varphi)$$

$$w = |w| \cdot \exp(i\psi)$$

$$\overline{\left(\frac{z}{w}\right)} = \overline{\frac{|z|}{|w|} \cdot \exp(i(\varphi - \psi))} =$$

$$\frac{|z|}{|w|} \cdot \exp(-i(\varphi - \psi)) =$$

$$\overline{\left(e^{i\varphi}\right)} \overset{!}{=} e^{-i\varphi}$$

$$\left(\frac{z}{w}\cdot\frac{\overline{w}}{\overline{w}}\right) = \left(\frac{z\cdot\overline{w}}{|w|^2}\right) =$$

$$\overline{(z\cdot\overline{w})} \overset{!}{=} \overline{z}\cdot\left(\overline{\overline{w}}\right) = \overline{z}\cdot w$$

or $z = (a+ib)$

$w = (c+id)$

$$\overline{\left(\frac{z}{w}\right)} = \overline{\left(\frac{z\cdot\overline{w}}{|w|^2}\right)} =$$

$$\overline{\left(\frac{(a+ib)(c-id)}{(c^2+d^2)}\right)} =$$

$$\overline{\left(\frac{(ac+bd)+i(bc-ad)}{(c^2+d^2)}\right)} =$$

$$\frac{(ac+bd)-i(bc-ad)}{c^2+d^2}$$

$$\frac{\overline{z}}{\overline{w}} = \frac{\overline{z}\cdot w}{\overline{w}\cdot w} = \frac{\overline{z}\cdot w}{|w|^2} =$$

$$\frac{(a-ib)(c+id)}{c^2+d^2} =$$

$$\frac{(ac+bd)+i(ad-bc)}{(c^2+d^2)}$$

so: $\overline{\left(\frac{z}{w}\right)} = \frac{\bar{z}}{\bar{w}}$

? or $\overline{\left(\frac{z}{w}\right)} = \bar{z} \cdot \overline{\left(\frac{1}{w}\right)} = \bar{z} \cdot \overline{\left(\frac{\bar{w}}{|w|^2}\right)} =$

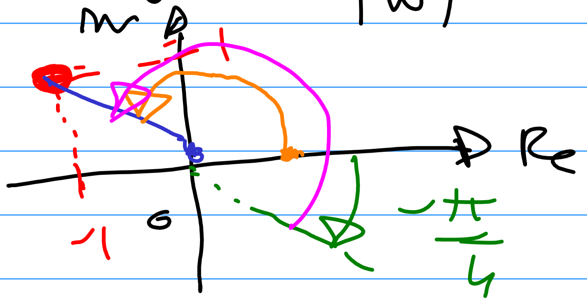
$$\bar{z} \cdot \frac{w}{|w|^2} = \bar{z} \cdot \frac{1}{\bar{w}} = \frac{\bar{z}}{\bar{w}}$$

maybe: $\begin{cases} z = a+ib \\ w = c+id \end{cases}$

(the way with the way with the least resistance?)

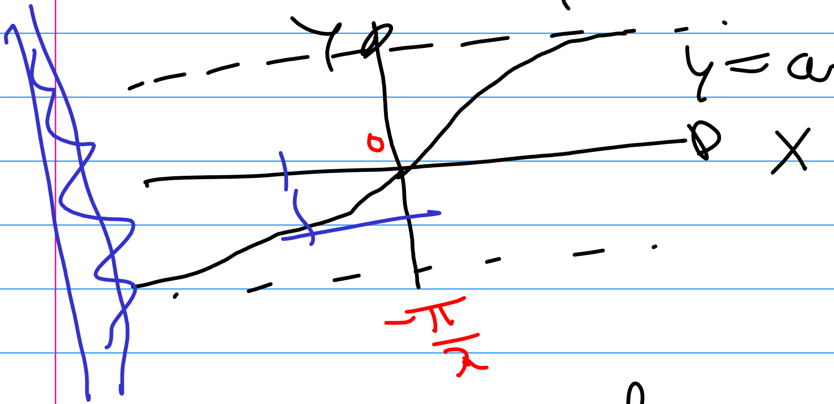
Keep in mind: $\frac{1}{w} = \frac{\bar{w}}{|w|^2}$

(5) $z = -1+i$



$|z| = \sqrt{2}$, $\underline{Arg(z)} = \boxed{\underline{\left(\frac{3}{4}\pi\right)}}$

$$\arctan\left(\frac{1}{-1}\right) = \arctan(-1) = -\frac{\pi}{4}$$

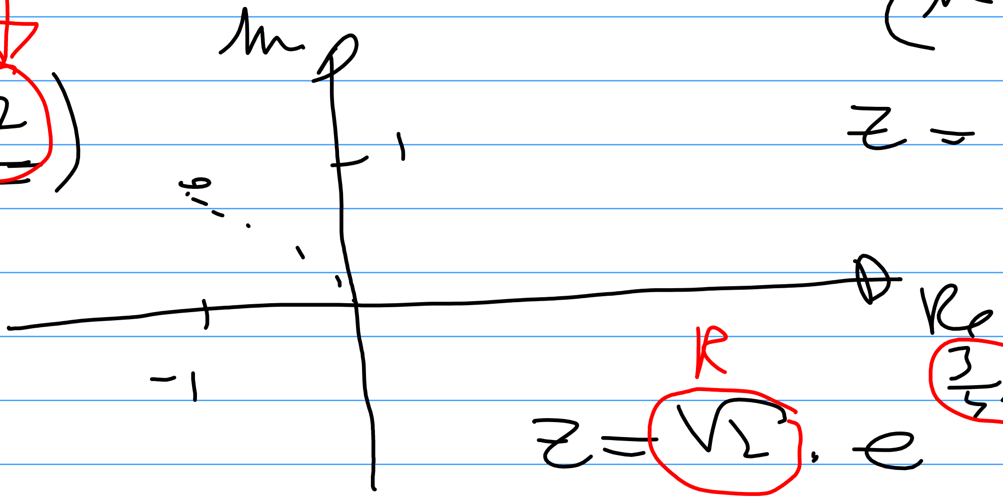


$$\varphi = \arctan\left(\frac{b}{a}\right)(\pm\pi)$$

$$\rightarrow \varphi = \arg(z) = \left(-\frac{\pi}{4} + \pi\right) + \boxed{k \cdot 2\pi}$$

$(k \in \mathbb{Z})$

$\underline{(47)}$



$z = -1 + i$

$$z = \underset{R}{\boxed{\sqrt{2}}} \cdot e^{\overset{}{\underset{\varphi}{\boxed{\frac{3}{4}\pi}}}i}$$

$$W = \underset{R}{\boxed{3}} \cdot e^{\overset{\varphi}{\boxed{\frac{\pi}{2}}}i}$$

$$z \cdot W = \underset{R}{\boxed{3 \cdot \sqrt{2}}} \cdot e^{i\left(\underset{\varphi}{\boxed{\frac{3}{4}\pi + \frac{\pi}{2}}}\right)}$$

$$\frac{z}{W} = \underset{R}{\boxed{\frac{\sqrt{2}}{3}}} \cdot e^{i\left(\underset{\varphi}{\boxed{\frac{3}{4}\pi - \frac{\pi}{2}}}\right)}$$

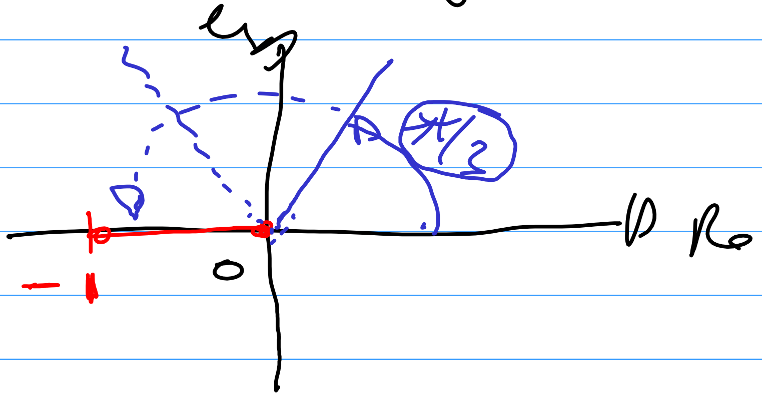
z, w in polar coordi

$z \cdot w$: multiply radi and summate arguments

$\frac{z}{w}$: divide radi subtract arguments

(5 1) $z^{\boxed{3}} = -1$

→ number of solutions.



$z \cdot z \cdot z =$

$\arg(z^3) =$

$3 \arg(z)$

$z^3 = -1$

$z = (R \cdot e^{i\varphi})$

$R^3 \cdot e^{i3\varphi} =$

$\left(-1 = 1 \cdot e^{(\pi + k2\pi)i}\right)$

$R^3 \cdot e^{i(3\varphi)} = 1 \cdot e^{(\pi + k2\pi)i}$

$\boxed{R = 1}$ $3\varphi = \pi + k \cdot 2\pi$

$$\varphi_k = \left(\frac{\pi}{3} + k \cdot \frac{2}{3}\pi\right)$$

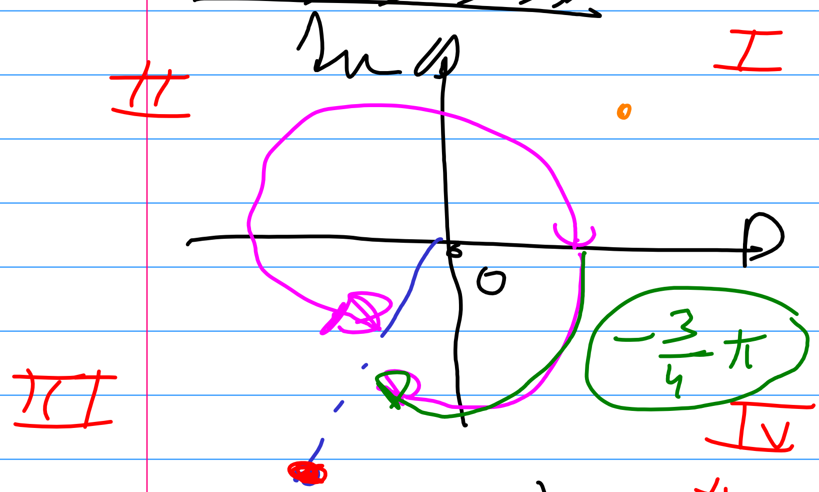
$k = 0, 1, 2$

$$\underline{z_k = 1 \cdot e^{i\varphi_k}}, \quad k = 0, 1, 2$$

$(k = 100, 101, 102$ or

$(k = 100, 104, 120?))$

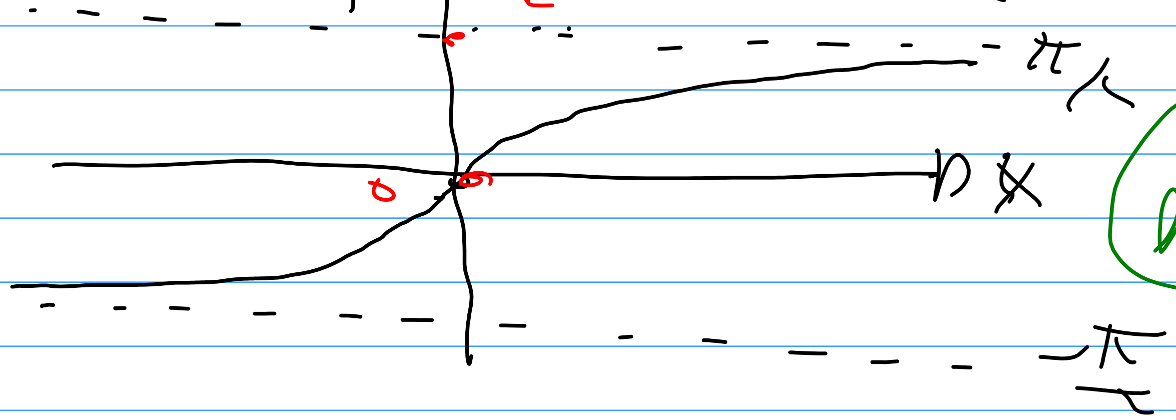
- $\underline{\mathrm{Arg}(z)}$: $\quad z = -1 - i$



$|z| = \sqrt{2}$

$$\left\{ \begin{array}{l} \arg(z) = \\ \arctan(1) \\ \boxed{+\pi} \end{array} \right.$$

$$= \frac{\pi}{4} + \pi = \boxed{\frac{5}{4}\pi}$$



$$\boxed{+\, k \cdot 2\pi}$$

$$\frac{5}{4}\pi - 2\pi = -\frac{3}{4}\pi$$

AJ ~~pg.~~

$$3i + (1 - 2i) - (2 + 3i) + 5 =$$

$$3i + 1 - 2i - 2 - 3i + 5 =$$

$$4 - 2i$$