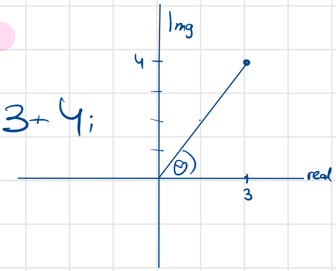
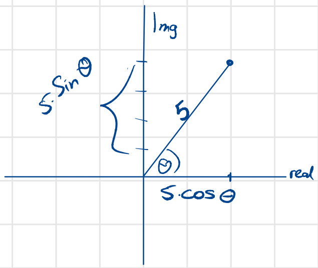
Ex: 1

.1 $z = 3+4i$



$$\theta = \tan^{-1}\left(\frac{4}{3}\right) \approx 0.927$$

$$r = \sqrt{3^2+4^2} = 5$$



$$z = 5\cdot\cos\theta + i\cdot 5\cdot\sin\theta$$

$$z = 5(\cos\theta + i\sin\theta)$$

$$z = 5e^{i\theta}$$

$$z = 5e^{i\tan^{-1}\left(\frac{4}{3}\right)}$$

② $\ln(a\cdot b) = \ln a + \ln b$ $\quad r = \sqrt{a^2+b^2}$

$$\ln(re^{i\theta}) = \ln r + \ln(e^{i\theta}) = \frac{1}{2}\ln(a^2+b^2) + i\theta\ln e$$

$\ln e = 1$ $\quad \theta = \tan^{-1}\left(\frac{b}{a}\right)$

$$\frac{1}{2}\ln(a^2+b^2) + i\tan^{-1}\left(\frac{b}{a}\right)$$

$$\ln z = \frac{1}{2}\ln(3^2+4^2)\, i\tan^{-1}\left(\frac{4}{3}\right)$$

$$= \frac{1}{2}\cdot 2\ln 5 + 0.93i$$

$$1.61 + 0.93i$$

Part 2

.3 $-2x + 2z = -4$

$-4x + z + y = 4$

$x + y - z = 0$

$$a = \left(\begin{array}{ccc|c} -2 & 0 & 2 & -4 \\ -4 & 1 & 1 & 4 \\ 1 & 1 & -1 & 0 \end{array}\right) \rightarrow \left(\begin{array}{ccc|c} 1 & 1 & -1 & 0 \\ -4 & 1 & 1 & 4 \\ -2 & 0 & 2 & -4 \end{array}\right) \rightarrow \left(\begin{array}{ccc|c} 1 & 0 & -1 & 0 \\ 0 & 5 & -3 & 4 \\ 0 & 2 & -1 & -4 \end{array}\right)$$

$$\rightarrow \left(\begin{array}{ccc|c} 1 & 1 & -1 & 0 \\ 0 & 1 & -\frac{3}{5} & \frac{4}{5} \\ 0 & 2 & -1 & -4 \end{array}\right) \rightarrow \left(\begin{array}{ccc|c} 1 & 0 & -\frac{2}{5} & 0 \\ 0 & 1 & -\frac{3}{5} & \frac{4}{5} \\ 0 & 2 & -1 & -4 \end{array}\right) \rightarrow \left(\begin{array}{ccc|c} 1 & 0 & -\frac{2}{5} & -\frac{4}{5} \\ 0 & 1 & -\frac{3}{5} & \frac{4}{5} \\ 0 & 0 & 1 & -28 \end{array}\right)$$

$$\rightarrow \left(\begin{array}{ccc|c} 1 & 0 & 0 & -12 \\ 0 & 1 & 0 & -16 \\ 0 & 0 & 1 & -28 \end{array}\right) \rightarrow \left(\frac{1}{-4}\right) \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 3 \\ 4 \\ 7 \end{pmatrix}$$

4.1 $A\cdot(x,y) = (1,1)$

General solution for $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

$a+b=2 \rightarrow b = 2-a$

$c+d=3 \rightarrow d = 3-c$

$$A = \begin{pmatrix} a & 2-a \\ c & 3-a \end{pmatrix}$$

4.2 $A\cdot(x,y) = (1,1)$

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} 1 \\ 1 \end{pmatrix} = \begin{pmatrix} -1 \\ 1 \end{pmatrix} =$$

$a+b=-1 \rightarrow b = -1-a$

$c+d=1 \rightarrow d = 1-c$

.5 player : total games : 30

no Score : 0.5

Score 1 : 0.25

Score 2 : 0.15

Score 3 : 0.1

$$30\big((0.5\cdot 0)+(0.25\cdot 1)+(0.15\cdot 2)+(0.1\cdot 3)\big) =$$

Gym = 0.4

3 options to see each other:

(1 Bob went to the gym exactly 5 times: $(0.4)^5 \cdot (0.6)^2$

(2 Bob went 6 times: $(0.4)^6 \cdot (0.6)^1$

(3 Bob went 7 times: $(0.4)^7$

$$\binom{7}{5}(0.4)^5 \cdot (0.6)^2 + \binom{7}{6}(0.4)^6 \cdot (0.6)^1 + \binom{7}{7} \cdot (0.4)^7$$

7 days
5 of them
went