Exercise 01

Part 1

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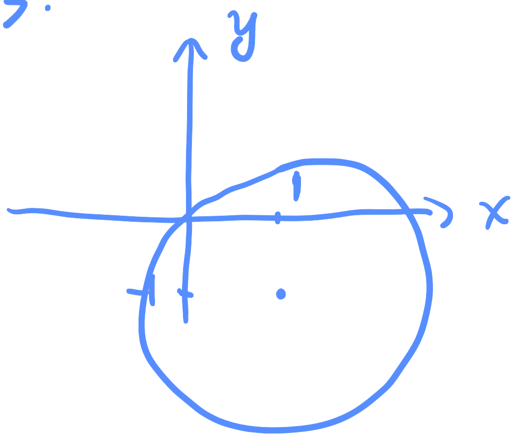
Part 2.

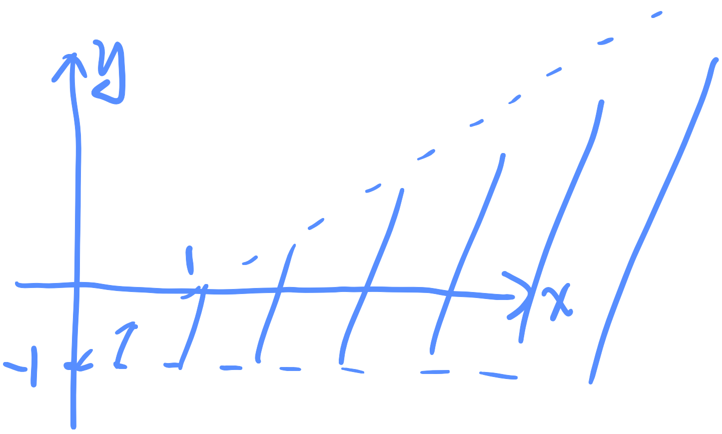
	real	imaginary	modulus	argument
(1)	-1	$\sqrt{3}$	2	$\frac{2}{3}\pi$
(2)	$1+\cos\theta$	$\sin\theta$	$\sqrt{2+2\cos\theta}$	$\begin{cases} \theta/2, & 0 \le \theta < \pi \\ \text{any}, & \theta = \pi \\ \theta/2 - \pi, & \pi < \theta \le 2\pi \end{cases}$
(3)	$\sin\theta$	$1-\cos\theta$	$\sqrt{2-2\cos\theta}$	$\begin{cases} \theta/2 & 0 < \theta < 2\pi \\ \text{any} & \theta = 0 \text{ or } 2\pi \end{cases}$
(4)	$e^{x}\cos y$	$-e^{-x}\sin y$	e^{x}	$-y$
(5)	$\cos(\sin x)$	$\sin(\sin x)$	1	$\sin x$

Part 3.

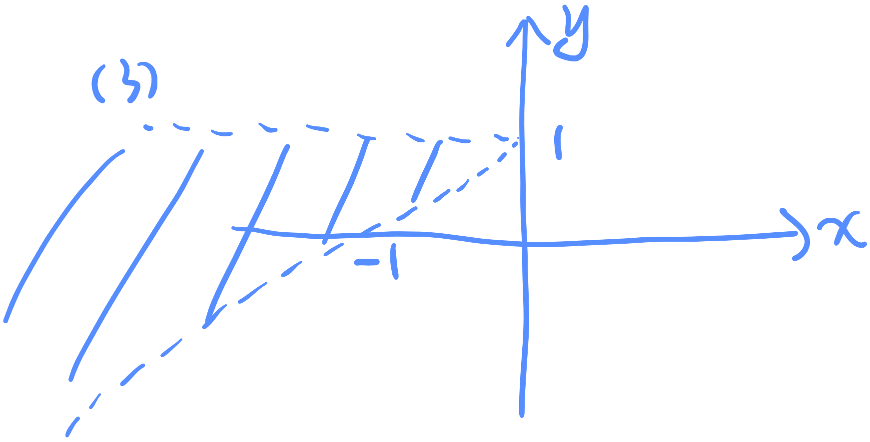
(1)



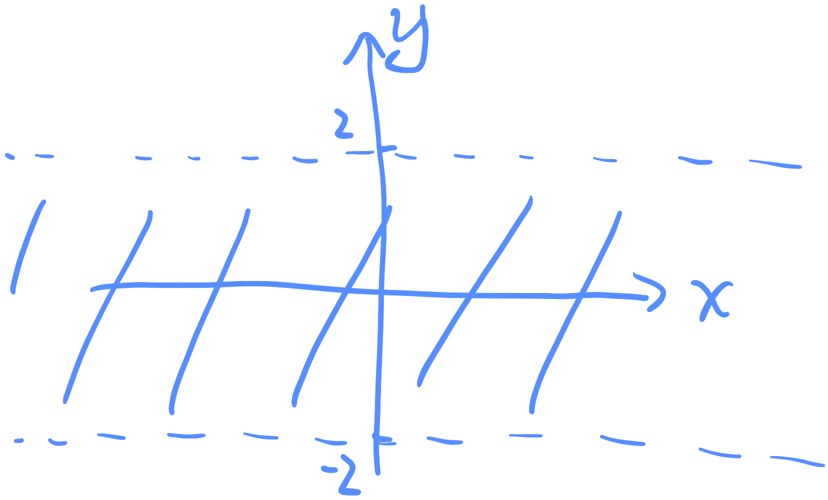
(2)



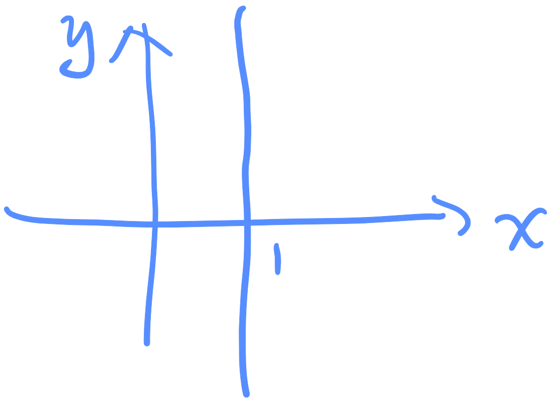
(3)



(4)



(5)



Part 4.

$$z = e^{i\theta} + e^{i2\theta} + \cdots + e^{in\theta} = \frac{e^{i\theta}(1 - e^{in\theta})}{1 - e^{i\theta}}$$

$$= e^{i\theta} \frac{e^{i\frac{n}{2}\theta}}{e^{i\frac{\theta}{2}}} \frac{e^{-i\frac{n}{2}\theta} - e^{i\frac{n}{2}\theta}}{e^{-i\frac{\theta}{2}} - e^{i\frac{\theta}{2}}}$$

$$= e^{i\frac{1}{2}(n+1)\theta} \frac{\sin\frac{n}{2}\theta}{\sin\frac{\theta}{2}}$$

(1)

$$\cos\theta + \cdots + \cos(n\theta) = \mathrm{Re}(z)$$

$$= \cos\frac{1}{2}(n+1)\theta \, \frac{\sin\frac{n}{2}\theta}{\sin\frac{\theta}{2}}$$

(2) $\sin\theta + \cdots + \sin(n\theta) = \mathrm{Im}(z)$

$$= \sin\frac{1}{2}(n+1)\theta \, \frac{\sin\frac{n}{2}\theta}{\sin\frac{\theta}{2}}$$