

Queens College, CUNY, Department of Computer Science
Numerical Methods
CSCI 361 / 761
Spring 2018
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due Friday, April 20, 2018, 11.59 pm

25 Homework lecture 25

- As experience has demonstrated, if you do not understand the above expressions/questions, **THEN ASK**.
- If you do not understand the words/sentences in the lectures, **THEN ASK**.
- Send me an email, explain what you do not understand.
- Do not just keep quiet and produce nonsense in exams.

25.1 Complex numbers

- Calculate the real and imaginary parts and $|z|^2$ of the complex number z .
- In all cases, the values of x , y , r and θ are real and $(\dots)^*$ denotes a complex conjugate.

$$z = (x + iy)^2. \quad (25.1.1)$$

$$z = \frac{1}{2 + 3i}. \quad (25.1.2)$$

$$z = \left(\frac{1 - i}{2 + 3i} \right)^*. \quad (25.1.3)$$

$$z = \frac{1}{re^{i\theta}} \quad (r \neq 0). \quad (25.1.4)$$

$$z = \frac{1}{1 + re^{i\theta}} \quad (1 + re^{i\theta} \neq 0). \quad (25.1.5)$$

25.2 Graph 1

- You are given that a and θ are real and

$$z = x + iy = \frac{1}{1 + ae^{-i\theta}}. \quad (25.2.1)$$

- Calculate the expressions for x and y as functions of a and θ .**
- Set $a = \frac{1}{2}$.
- Fill in the following table for the values of x and y .**

θ	x	y
0°		
90°		
180°		
270°		

- Plot a graph in the (x, y) plane, for 201 values $\theta = j\pi/100$, where $j = 0, 1, \dots, 200$.**
- If you have done your work correctly, the graph will be a closed curve.*
- Set $a = 2$.
- Fill in the following table for the values of x and y .**

θ	x	y
0°		
90°		
180°		
270°		

- Plot a graph in the (x, y) plane, for 201 values $\theta = j\pi/100$, where $j = 0, 1, \dots, 200$.**
- If you have done your work correctly, the graph will be a closed curve.*
- (Optional) *Do you recognize the shapes of the curves?***

25.3 Graph 2

- You are given that a and θ are real and

$$z = x + iy = \exp\{ia \sin(\theta)\}. \quad (25.3.1)$$

- Calculate the expressions for x and y as functions of a and θ .
- Set $a = 3$ below.
- Plot graphs of
 - (i) x as a function of θ ,
 - (ii) y as a function of θ .Use 201 values $\theta = j\pi/100$, where $j = 0, 1, \dots, 200$.
Plot both curves in the same graph.
On the horizontal axis, plot the value of θ/π , so $0 \leq \theta/\pi \leq 2$.

- If you have done your work correctly, the curves should display the following symmetries:

$$\begin{aligned} x(\theta + \pi) &= x(\theta), \\ y(\theta + \pi) &= -y(\theta) \end{aligned} \quad (0 \leq \theta < \pi). \quad (25.3.2)$$