

Math 2173 Spring 2021 Recitation Handout 12

Group Member 1: _____

Group Member 2: _____

Group Member 3: _____

Group Member 4: _____

Group Member 5: _____

Group Member 6: _____

Below is a checklist of instructions to follow when completing this assignment. Failure to follow these directions will result in penalty on your final score and/or in some problems not being graded. If multiple directions are not followed, then it is also possible that the assignment will not be accepted for any credit at all. Please contact your TA or make a post on the discussion boards for this course if you have any questions about this assignment or these directions.

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Checklist of Instructions	
	Please clearly write the names of all group members working on this assignment in the spaces allotted above.
	This assignment must be completed by a group of 3, 4, 5, or 6 members.
	This assignment is to be uploaded to gradescope as a pdf file no later than 11:59 PM EST on Sunday, April 18.
	The assignment will be uploaded by 1 group member, and that group member will be responsible for manually entering the names of all other collaborators into gradescope.
	This assignment must be completed using this template. You may either print this template to write on it and then scan it (pages ordered correctly) into a pdf file, or you may write directly on the template using programs such as notability.
	If you need more space than what is given to solve a given problem, then you will find blank pages provided at the end of this template. At the end of each problem section of this assignment you will find a space in which to indicate on what page your work is continued in case you used additional pages to complete your solution. You must provide the page number on which your work is continued in the allotted space, or write 'N/A' in case you did not use any additional pages.
	On the additional pages, you will also find space in which to indicate which problem the page is being used for, and if the page is used then that space must also be filled.
	To complete this handout, you may use your textbook, class notes, discussions with your TA and group members, and any resources that are available on Carmen. You should not receive any help from the MSLC or people outside of your group when solving these problems. You may discuss these problems on the Carmen discussion boards, but you should not provide your entire solution when answering a such question, you should only give a hint or a helpful idea.

Ungraded Optional Problem 16.2.29: Solve the following initial value problem.

$$(1) \quad y'' - 2y' + 5y = 0; \quad y(0) = 1, y'(0) = -1.$$

Draw the graph of the solution.

Ungraded Optional Problem 16.2.43: Express the function

$$y = -3 \sin(4t) + 3 \cos(4t)$$

in the form

$$y = A \sin(\omega t + \varphi).$$

Draw the graph the function and explain the roles A , ω and φ that play in the graph.

Problem 1 (4+4+4=12 points): Let $z = -1 + i$ and $w = 1 + i\sqrt{3}$ be the two complex numbers.

(1) Compute directly $z \cdot w$ and $\frac{z}{w}$ and express the answer in Cartesian form, i.e., the form $x + iy$, where x and y are real numbers.

(2) Express z and w in polar form. Compute $z \cdot w$ and $\frac{z}{w}$ in polar forms. Compare your answer with part (1).

(3) Draw the four complex numbers w , z , $z \cdot w$ and $\frac{z}{w}$ in the following coordinate. Explain what multiplication by w and division by w do to the complex number z in terms of argument and modulus.

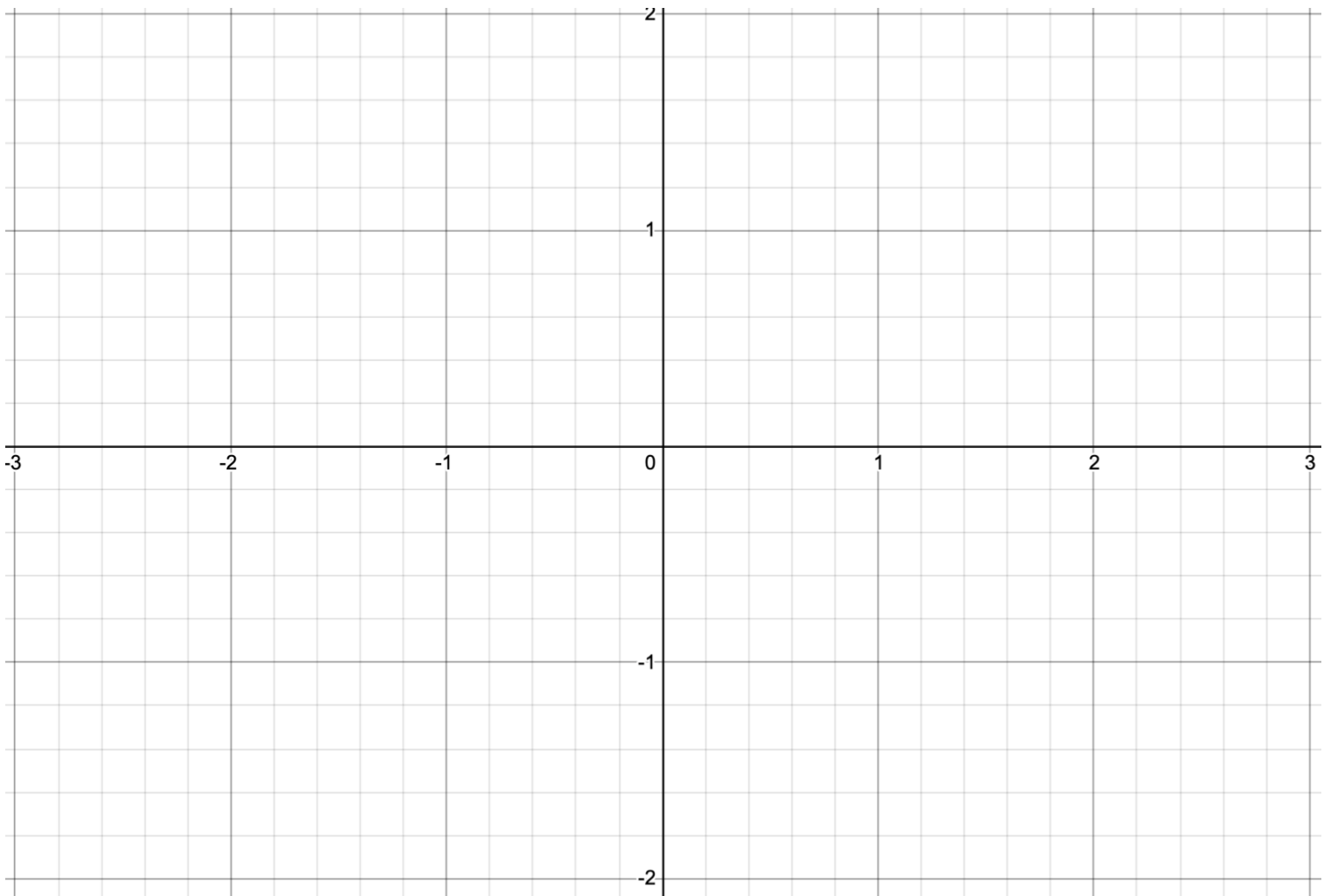


FIGURE 1. A grid to help you plot w , z , $z \cdot w$, and $\frac{z}{w}$.

Problem 2 (8 points): (Appendix C. 29, 30)

(1) Equate the real and imaginary parts of both sides of the identity

$$e^{i(a-b)} = e^{ia} e^{-ib}$$

to prove that

$$\cos(a - b) = \cos(a) \cos(b) + \sin(a) \sin(b);$$

$$\sin(a - b) = \sin(a) \cos(b) - \cos(a) \sin(b).$$

(2) Equate the real and imaginary parts of both sides of the identity

$$e^{i2\theta} = e^{i\theta} \cdot e^{i\theta}$$

to prove that

$$\sin(2\theta) = 2 \sin(\theta) \cos(\theta), \text{ and } \cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)$$

Problem 16.2.17 (10 points): Solve the following initial value problem.

$$(2) \quad y'' - 3y' - 18y = 0; \quad y(0) = 0, y'(0) = 4.$$

Draw the graph of the solution. (You may seek help from graphing website/software. Think about why the graph behave in that way and how is that related to the solution function.)

Problem 16.2.23 (10 points): Solve the following initial value problem.

$$(3) \quad y'' - y' + \frac{1}{4}y = 0; \quad y(0) = 1, y'(0) = 2.$$

Draw the graph of the solution. (You may seek help from graphing website/software. Think about why the graph behave in that way and how is that related to the solution function.)

Problem 16.2.31 (10 points): Solve the following initial value problem.

$$(4) \quad y'' + 6y' + 10y = 0; \quad y(0) = 0, y'(0) = 6.$$

Draw the graph of the solution. (You may seek help from graphing website/software. Think about why the graph behave in that way and how is that related to the solution function.)

Problem 16.2.37 (10 points): Solve the following initial value problem.

(5)
$$t^2 y'' + 6ty' + 6y = 0; \quad y(1) = 0, \quad y'(1) = -4.$$

Draw the graph of the solution. (You may seek help from graphing website/software. Think about why the graph behave in that way and how is that related to the solution function.)

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