

MATH 271, QUIZ 1  
DUE SEPTEMBER 3<sup>RD</sup> AT THE END OF CLASS

**Instructions** You are allowed a textbook, homework, notes, worksheets, material on our Canvas page, but no other online resources (including calculators or WolframAlpha) for this quiz. **Do not discuss any problem any other person.** All of your solutions should be easily identifiable and supporting work must be shown. Ambiguous or illegible answers will not be counted as correct.

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**THERE ARE 5 TOTAL PROBLEMS.**

**Problem 1. (3 pts.)** Given two complex numbers  $z_1 = 1 - i$  and  $z_2 = -2 + i$ , draw a picture showing how to find the sum  $z_1 + z_2$ . Also, draw a picture of  $-z_1$  and  $2z_1$  and explain what these scaling operations do to a complex number.

**Problem 2. (3 pts.)** Let  $z_1 = e^{i\frac{\pi}{4}}$  and  $z_2 = e^{-i\frac{\pi}{2}}$ . Graph  $z_1$ ,  $z_2$ , and the product  $z_1 z_2$  in the  $\mathbb{C}$ -plane. *Hint: recall that there are  $2\pi$  radians in a full circle.*

**Problem 3.** Consider the function  $x(t) = e^{it}$ .

- (a) **(2 pts.)** Explain why this function is periodic with period  $2\pi$ .
- (b) **(2 pts.)** What is the real part of  $x$ ?
- (c) **(2 pts.)** Show that  $x$  is a solution to the ODE:  $x'' = -x$ .

**Problem 4. (4 pts.)** Explain what it means to be a general solution to an ODE. Explain what it means to be a particular solution to an initial value problem. What are the key differences between general and particular solutions?

**Problem 5. (3 pts.)** (Hooke's law) Write down an initial value problem based on the following statement.

*"The rate of change of the rate of change of position of a mass is proportional to the position but in the opposite direction."*