

Math 1149 - Third Midterm Exam

First and last name (please, print): _____
OSU email address (please, print): _____

Here are the rules for this exam.

1. You have **24 hours** to complete this exam.

2. **If you are writing this exam on your tablet, fill-in your full name and your OSU email address in the space provided above. If you are writing this exam on paper, put your name and OSU email address at the beginning of your papers.**

3. **There are 6 questions in total**, all having multiple parts. For full credits, **show all your work**, that is, make sure that what you write is enough to understand your solutions and thinking process.

4. This is an **open-book exam** (you can consult your notes and the textbook), on which you are **supposed to work on your own, without online aids and without aids from other people. By taking and turning in this exam, you pledge your honor to abide by these rules. Breaking these rules is considered academic dishonesty, and will be treated accordingly.**

5. **Write legibly.**

Do not panic and good luck!

1. (21 points) Solve the following trigonometric equations as indicated.
 - (a) (7 points) Solve $4(\sin(\frac{x}{4}) + 3) = 14$ over the real numbers. (Do NOT use any formula to rewrite $\sin(\frac{x}{4})$.)
 - (b) (7 points) Solve $\cos^4(x) - \cos^2(x) \sin^2(x) = 0$ over $[0, 2\pi)$. (Factor and use appropriate trigonometric identities.)
 - (c) (7 points) Solve $\sec^2(x) + \tan(x) - 1 = 0$ over $[0, 2\pi)$. (Use an appropriate Pythagorean identity, then factor.)

2. (11 points) Consider the triangle $\triangle ABC$ with $A = 25^\circ$, $C = 110^\circ$, and $a = 4$.
- (a) (8 points) Solve the triangle. Give both exact and approximate answers, rounded to one decimal place.

- (b) (3 points) Find the area of the triangle. Approximate your answer to one decimal place.

3. (24 points) In each of the following cases, solve the triangle with the given data. Give approximate answers, rounded to one decimal place.

(a) (12 points) $b = 25$, $c = 20$, $C = 32^\circ$.

(b) (12 points) $b = 15$, $c = 10$, $A = 65^\circ$.

4. (12 points) Consider the following complex numbers:

$$z = -6 + 2\sqrt{3}i, \quad w = \frac{1}{4} \left(\cos \left(\frac{5\pi}{12} \right) + \sin \left(\frac{5\pi}{12} \right) i \right).$$

- (a) (5 points) Write z in polar form.

- (b) (7 points) Compute the product $z \cdot w$. Give your final answer in the form $a + bi$. (You will need to simplify a fraction at some point in order to write the final answer in the form $a + bi$.)

5. (10 points) Consider the complex number

$$z = 2 - 2i.$$

- (a) (4 points) Write z in polar form.

- (b) (6 points) Compute z^6 . Give your final answer in the form $a + bi$.

6. (12 points) Find all 3rd roots of $8i$ over the complex numbers. Give your answers in the form $a + bi$.

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Use this page if you need more space for your computations.

If you want something you write here to get marked, make it clear which exercise your work refers to.