

BGSU Mathematics Competition
April 2 2016 **B**

No cell phones are allowed. Show all work. Explain your answers.

1) Find the sum of the solutions for the equation $\sqrt{-x^2 + 2x + 3}\sin(4x) = 0$.

2) Solve:

$$\left(\left(\left(\left(81 + x\right)\frac{1}{3} + x\right)\frac{1}{3} + x\right)\frac{1}{3} + x\right)\frac{1}{3} = 1$$

3) Joe is running 4 laps. His goal is to average 10 miles per hour. If he runs the first 3 laps at an average of 9 miles per hour, then how fast must Joe run the 4-th lap (in miles per hour) in order to achieve his goal?

4) Let x be an integer such that $10 \leq x \leq 99$. Let $y(x)$ be the number such that the two digits in x are switched (for example: if $x = 36$ then $y(36) = 63$). How many x exist such that $x + y(x)$ is a perfect square?

5) Let $ABCDEFGH$ be a cube. Assume that $ABCD$ is the base of the cube and AB , AD and AE are edges of the cube. Find the cosine of the angle $\angle ACE$.

6) You and two other friends have purchased a 45 ounce pitcher of soda (45 ounces fills the pitcher to the brim). Unfortunately you were sent with three different sized cups. One holds 25 ounces, one holds 20 ounces and one holds 10 ounces. How could you distribute the soda evenly without spilling a drop?

7) A cake has a quadrilateral shape (four sides). We cut the cake along the two diagonals and eat one of the four pieces. The three remaining pieces weight: 120 grams, 200 grams and 300 grams respectively. What was the initial weight of the cake? (you may assume that the cake has even thickness).

8) Find the sum:

$$2 + 4 + 6 + 8 + \dots + 2014 + 2016$$

Registration 2016 BGSU Mathematics Competition;

Your NAME:

(Optional) Math class you are registered, and name of your instructor: