

BGSU Mathematics Competition
March 25 2017 **B** (Calculus III and below)

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

1) Find the sum:

$$1 + 4 + 7 + 10 + \dots + 2011 + 2014 + 2017$$

2) If $\log_2(\log_2(\log_2(x))) = 0 = \log_4(\log_3(\log_2(y)))$, find xy .

3) Find the largest value of n for which $8^{20}15^{17}17^{20}$ is divisible by 10^n .

4) You have programmed a robot to walk in a pattern by going 7 feet forward, followed by 8 feet backward and then followed by 4 feet forward. The robot continues this pattern in a straight line. If every foot of movement takes 1 second. How many seconds will it take before the robot reaches 1000 feet?

5) A 2×3 rectangle has vertices as $(0, 0)$, $(2, 0)$, $(0, 3)$, and $(2, 3)$. It rotates 90° clockwise about the point $(2, 0)$. It then rotates 90° clockwise about the point $(5, 0)$, then 90° clockwise about the point $(7, 0)$, and finally, 90° clockwise about the point $(10, 0)$. (The side originally on the x -axis is now back on the x -axis.) Find the area of the region above the x -axis and below the curve traced out by the point whose initial position is $(1, 1)$.

6) Let R be the region consisting of the points (x, y) of the cartesian plane satisfying both $|x| - |y| \leq 1$ and $|y| \leq 1$. Sketch the region R and find its area.

7) Show how to cut a 9×16 rectangle into two pieces that can be assembled into a 12×12 square.

8) Find the sum:

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \dots + \frac{1}{2015 \cdot 2016} + \frac{1}{2016 \cdot 2017}$$

(Hint: Find A and B such that $\frac{1}{k(k+1)} = \frac{A}{k} + \frac{B}{k+1}$)

Registration 2017 BGSU Mathematics Competition;

Your NAME:

E-mail:

(Optional)

Math class you are registered:

Name of your instructor:

1)

2)

3)

4)

5)

6)

7)

8)

Total: