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EXAM I, MTH 211, Fall 2009

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REMARK: EACH QUESTION IS 25 POINTS

QUESTION 1. a) Use a MARKED RULER and a COMPASS ONLY to construct the GOLDEN RATIO $(\sqrt{5}+1)/2)$. STATE the steps of construction, DO NOT WRITE ANY MATH. JUSTIFICATION.

b) Draw a line segment of length 7, and another line segment of length 9. NOW USE UNMARKED RULER, a line segment of length one, and COMPASS ONLY to construct the number $\frac{7}{9}$. DO NOT USE ANY SCALE!!!! I WANT to see THE LINE SEGMENT OF LENGTH $\frac{7}{9}$. STATE THE STEPS OF CONSTRUCTION WITHOUT ANY MATH JUSTIFICATION.

QUESTION 2. a) USE A MARKED RULER and a COMPASS ONLY to construct a line segment of length $\sqrt{11}$. (There are two ways to do that, one way WAS DISCUSSED in one of the projects, it would be nice if some of you USE HIS (HER) HEAD and come up with a different way!!!) STATE THE STEPS OF CONSTRUCTION WITHOUT ANY MATH JUSTIFICATION.

b) CALL THE line segment in (a) AB. Now divide AB into six parts in order to construct two triangles: one is acute golden triangle and the other is an obtuse golden triangle (Note that the sum of all sides of the two triangles must add up to the length of AB = $\sqrt{11}$). STATE THE STEPS OF CONSTRUCTION WITHOUT ANY MATH JUSTIFICATION.

QUESTION 3. a) Draw a line segment of length 1.5cm. Now hide your marked RULER. USE unmarked ruler and a compass to construct a regular 6-gon such that the length of each side is 1.5cm. STATE THE STEPS OF CONSTRUCTION WITHOUT ANY MATH JUSTIFICATION.

b) Draw a line segment of length 1.5cm. Now hide your marked RULER. USE unmarked ruler and a compass to construct a regular 5-gon such that the length of each side is 1.5cm. STATE THE STEPS OF CONSTRUCTION WITHOUT ANY MATH JUSTIFICATION.

QUESTION 4. a) They say: Fibonacci sequence is somehow connected to the golden ratio. Explain this connection.

b) Is it possible that F_{125} be a prime number? note that F_{125} is the 125th number in the Fibonacci sequence.

c) Give me an angle say $\alpha > 0$ such that it is possible to construct α but there is no regular n-gon where each angle by the center is α.

d) Can we construct a regular 21-gon? explain. Can we construct an angle of 9 degree? explain

e) Let $a_1 = 1, a_2 = 1, ..., a_n = a_{n-1} + 2a_{n-2}$. Now construct the ratio sequence, $b_1 = \frac{a_2}{a_1}, b_2 = \frac{a_3}{a_2}, ..., b_n = \frac{a_n}{a_{n-1}}$. I claim that the sequence $\{b_n\}$ converges to the number 2 Verify my claim.

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