

Math 113: Final Exam

Name: _____

Tuesday, May 8, 2007

Directions: Answer every question. There are two proofs at 10 points each, four calculation questions at five points each, and 20 short-answer questions at 3 points each.

1. Which Platonic Solid has pentagons as faces?
2. Determine whether or not each of the following numbers are prime: 51, 97, 133
3. What mathematical principle allows us to conclude that two people in this room were born in the same month?
4. List the first ten Fibonacci numbers and the rule for generating more numbers on the list.
5. Give the exact value and the decimal approximation for the Golden Ratio.
6. Determine whether each number is rational or irrational: $\frac{55}{71}$, $\sqrt{5}$, $\sqrt{36}$
7. True or False: There are different sizes of infinity.

8. A planar graph has 18 vertices and 10 faces. How many edges does it have?

9. A right triangle has legs of length 5.8 cm and 19.2 cm. Find the length of the hypotenuse.

10. An art gallery has 26 vertices. What is the most cameras necessary to watch every point in the gallery?

11. An art gallery has 7 vertices. What is the fewest cameras necessary to watch every point in the gallery?

12. What's so special about a Möbius strip?

13. The long side of a Golden Rectangle is 12 meters long. Find the length of the short side.

14. Sketch an example of a simple, polygonal, closed curve.

15. Is there a one-to-one correspondence between the set of natural numbers and the set of rational numbers?

16. How many Platonic solids are there?
17. What are two letters of our alphabet that are equivalent by distortion to E?
18. What is symmetry of scale?
19. Give one example of a real-world application of one of the following: prime numbers, Platonic Solids, pinwheel pattern.
20. In the following image from The Simpsons, Homer has written $987^{12} + 4365^{12} = 4472^{12}$ on the blackboard. Is this equation correct?



21. Convert $0.737373737373\dots$ into a fraction. Show work.

22. You are trying to save \$1,000,000 by making monthly payments into an account over the next 50 years. If your account has an interest rate of 4%, how much do you have to deposit in the account each month?

23. You buy a house in West Knoxville and borrow \$200,000 at an interest rate of 6.2%, and you will be making monthly payments for the next 30 years. Calculate the monthly payment.

24. A sports league is facing allegations that its players are using steroids; media reports estimate that 5% of players in the league are using steroids. The league has contracted with a lab to test all 1200 players. The lab says that their test will detect steroid use 95% of the time. They also say that if a player is not using steroids, then the test will come back negative 99% of the time. What percent of the players who test positive are actually using steroids? Show all work.

25. Prove: There are infinitely many prime numbers.

26. Prove: The Pythagorean Theorem