

MATHEMATICS 112 FINAL EXAM May 18th, 2007

Name: \_\_\_\_\_

Instructor and section: \_\_\_\_\_

1. There are 16 problems on 12 pages (counting this page).
2. No graphing or programmable calculators, notes, or books are allowed. Scientific calculators are allowed but are not needed.
3. Give exact answers (fractions, square roots, etc.). Decimal approximations may not receive full credit.
4. You do not need to simplify your answers unless told to. Answers such as  $x = \frac{3^2\sqrt{25} + 6}{12}$  are okay.
5. Use only the scratch paper provided. Work appearing on your scratch paper will not be graded.
6. Show your work and make your methods clear. Unjustified answers may receive no credit.
7. Put your final answer in the box provided.

Problem	Possible Score	Your Score
1	12	
2	12	
3	10	
4	10	
5	10	
6	15	
7	12	
8	10	
9	15	
10	15	
11	10	
12	12	
13	12	
14	15	
15	15	
16	15	
TOTAL	200	

1. (6 points each) Simplify each of the following expressions as much as possible. (Answers on this page will receive either full credit or no credit.)

(a)  $\sqrt{8x^8y^8 - 4x^4y^4} =$

Answer:

(b)  $\frac{5^{(3-\frac{x}{2})}}{5^{(\frac{x}{2}+3)}} =$

Answer:

2. (6 points each) Simplify each of the following expressions as much as possible. (Answers on this page will receive either full credit or no credit.)

(a)  $\log_5(x^4) - \log_5 x =$

Answer:

(b)  $\log_{25}(x^4) - \log_5 x =$

Answer:

3. (10 points) Solve the equation  $\log_6 x + \log_6(x + 5) = 2$ .

Answer:

4. (10 points) Solve the equation  $7^{|2x+7|} = 343$ .

Answer:

5. (10 points) Solve the equation  $x = \sqrt{x + 49} + 7$ .

Answer:

6. (15 points) Draw a graph of  $y = \frac{x - 2}{x + 4}$ . Specify all intercepts and asymptotes. (Draw neatly. You may lose points for indecipherable answers.)

7. (6 points each)

(a) Simplify the following expression as much as possible:  $\frac{i^3 + 2i}{i^2 - i}$

Answer:

(b) Find all complex solutions to the equation  $x^2 + 8x + 25 = 0$ .

Answer:

8. (10 points) Solve the inequality  $\log_3(x - 7) < 4$ .

Answer:

9. (15 points) Ben invests \$1000 in a savings account with a (nominal) annual interest rate of 4% compounded semiannually (twice per year). How much money will Ben have in the account after 15 years?

Answer:

10. (15 points) Draw a graph of  $y = 2^x - 4$ . Specify all intercepts and asymptotes. (Draw neatly. You may lose points for indecipherable answers.)

11. (10 points) A colony of bacteria doubles in size every 3 hours. If there are initially 2000 bacteria present, how many will there be after 11 hours?

Answer:

12. (12 points) Determine the constants  $a$  and  $b$ , given that the parabola  $y = x^2 + ax + b$  passes through the points  $(1, 7)$  and  $(3, 33)$ .

Answer:

13. (12 points) A certain alloy contains 20% tin and 50% copper. (The percentages are by weight.) How many pounds of tin and how many pounds of copper must be melted with 1000 lb of the given alloy to yield a new alloy containing 25% tin and 60% copper?

Answer:

14. (15 points) Solve the system of equations:

$$x + y + z = 50$$

$$2x - y + z = 35$$

$$5y - z = 15$$

Answer:

15. (15 points) Find the quotient and remainder when  $x^5 + x^4 - 5x^2 + 3$  is divided by  $x^2 - 4$ .

Answer:

16. (15 points) Solve the system of equations:

$$xy = 70$$

$$2y - 2x = 6$$

Answer: