

**Math 111**  
**Final Exam**  
**June 2009**

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

1. Your exam contains 9 questions and 7 pages; Please make sure you have a complete exam.
2. The entire exam is worth 100 points. Point values vary and these are indicated on each problem. You have 2 hours for this exam.
3. Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification.
4. If you need extra space, use the back of the exam and clearly indicate this.
5. You are allowed one  $8.5 \times 11$  sheet of handwritten notes (both sides). Graphing and scientific calculators are allowed.
6. Leave answers in exact form as **simplified as possible** unless otherwise specified.

Problem	Total Points	Score
1	14	
2	10	
3	6	
4	8	
5	10	
6	18	
7	14	
8	14	
9	6	
Total	100	

1. (14 pts.) Solve the following equations.

(a) (5 pts.)  $9(1.5)^x = 4.5^x$

(b) (5 pts.)  $\frac{2}{t} + t = 7$

(c) (4 pts.)  $3\sqrt[4]{x+1} - 5 = 1$

2. (10 pts.) Consider the function  $h(x) = \frac{2x^2+16x+32}{3x^2-9}$ .

(a) (5 pts.) Find the  $x$ -intercept(s) of  $h(x)$ .

(b) (5 pts.) Write **equations** of the horizontal and vertical asymptotes of  $h(x)$  (if any).

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3. (6 pts.) You want to buy a \$350,000 house. If you make a \$70,000 down payment and get a 30-year mortgage at 5.4% compounded monthly for the rest, how much will your monthly payments be? (Round to the nearest cent.)

4. (8 pts.) Suppose you borrow \$10,000 at 5% compounded annually, which you will have to pay back (with interest) at the end of 10 years.

You want to establish a sinking fund that would give you 3% compounded quarterly. If you invest \$400 each quarter into this fund, will you have enough after 10 years to pay off your loan?

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5. (10 pts.) Suppose it cost you \$1500 initially (for equipment) and then \$7 each to produce toy cars.

(a) (5 pts.) Write a formula for the total cost  $C$  of producing  $q$  toy cars.

(b) (5 pts.) If you sell each car for \$14, will you make a profit if 150 cars are sold? (Justify your answer.)

6. (18 pts.) Consider the function  $f(x) = 4x^2 - 24x$ .

(a) (6 pts.) Find the domain and the range of the  $f(x)$ .

(b) (6 pts.) Find the point(s) of  $f(x)$  that have  $y$ -coordinate of 28 (if any).

(c) (6 pts.) Given that  $f(x) = 4x^2 - 24x$ , simplify the following as much as possible:  $\frac{f(x+h) - f(x)}{h}$

7. (14 pts.) Consider an account that gives a great interest rate of 9% compounded monthly.

(a) (4 pts.) What is the effective annual rate of the account?

(b) (5 pts.) How much would you need to invest today as a lump sum to have \$10,000 in this account after 15 years?

(c) (5 pts.) How long does it take your balance to double in this account?

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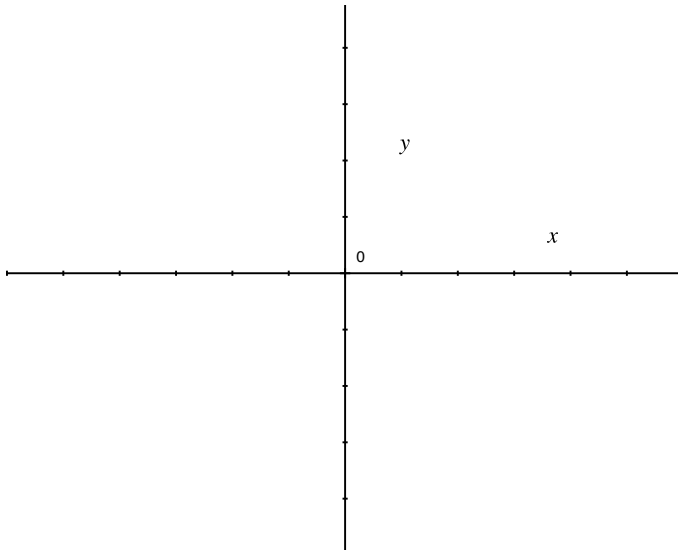
8. (14 pts.) Consider the piecewise-defined function  $g(x) = \begin{cases} x - 2 & \text{for } x < 2 \\ \sqrt{x - 2} & \text{for } 2 < x \end{cases}$ .

(a) (4 pts.) Find  $g(g(3)) + 5$ .

# 8 Continued →

#8 Continued:

(b) (6 pts.) Sketch  $g(x)$  on the axes below. (Include a scale on your axes.)



(c) (4 pts.) Find  $g^{-1}(10)$ .

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9. (6 pts) Find the domain of the following functions:

(a) (2 pts.)  $f(x) = \log(10 - x)$

(b) (2 pts.)  $g(x) = \frac{2}{x} - \frac{x-5}{x+13}$

(c) (2 pts.)  $h(x) = 5x^4 + 7x - 3$